# DRAFT
# PROGRAMMATIC ENVIRONMENTAL ASSESSMENT
# WITH ANTICIPATED FONSI
# FOR THE MĀKUA IMPLEMENTATION PLAN
# O‘AHU, HAWAI‘I
# APRIL 2006

DEPARTMENT OF THE ARMY
HEADQUARTERS, 25TH INFANTRY DIVISION &
US ARMY, HAWAI'I
SCHOFIELD BARRACKS, HAWAI'I 96857-5013

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PREPARED BY:

Michelle Mansker 4/5/06
MICHELLE L. MANSKER Date
Natural Resources Manager
Directorate of Public Works

REVIEWED BY:

10 Apr 06
ALAN K. L. GOO Date
Director of Public Works
US Army Garrison, Hawaii

APPROVED BY:

18 APR 06
HOWARD J. KILLIAN Date
Colonel, US Army
Commander, US Army Garrison, Hawaii

# Executive Summary

This Programmatic Environmental Assessment (PEA) for the Construction and Maintenance of Hawaiian Ecosystem Management Units as Part of the Mākua Implementation Plan was written in accordance with both the Army's National Environmental Policy Act (NEPA) and Chapter 343 of Hawaii Revised Statutes. The Army anticipates a Finding of No Significant Impact (FONSI) regarding the proposed action, as the actions are expected to be beneficial to Hawaiian ecosystems.

In 1998, the U.S. Army (Army) initiated a formal consultation under section 7 of the Endangered Species Act (16 U.S.C. 1531 et seq.) with the U.S. Fish and Wildlife Service (USFWS) to determine if routine military training at Mākua Military Reservation (MMR) would jeopardize the continued existence of 41 endangered species. The USFWS issued a non-jeopardy Biological Opinion (BO) for routine military training at MMR based on the agreement that the Army manage 27 endangered plant species and 1 endangered snail species to stability. This consultation resulted in the creation of the Mākua Implementation Plan (MIP), a comprehensive conservation plan to stabilize each of those species. The MIP was created with biologists from the USFWS, State Department of Land and Natural Resources, The Nature Conservancy of Hawai'i, Hawai'i Natural Heritage Program, and the Honolulu Board of Water Supply. An addendum to the MIP was completed in 2004 to focus on the bottom line conservation measures recommended by the USFWS in their BO.

The end goal of the MIP is to have three naturally reproducing population units (PU) for each endangered species potentially affected by routine military training at MMR. The Army is proposing to stabilize 28 species within 23 management units (MUs) which will protect approximately 2,703 acres of priority habitat. All ungulate exclosures and MUs are proposed to be established within the next 9 years. The construction and maintenance of ungulate exclosures around MUs, erosion control measures, alien plant, alien invertebrate, and small mammal control within MUs, genetic collections of endangered plant and snail populations, and reintroductions and augmentations of endangered species all constitute the Proposed Action for this environmental assessment. Additionally, the Proposed Action includes the development and implementation of fire control plans for MUs that are potentially fire threatened.

The No Action Alternative for the Proposed Action is expected to have a negative impact on native Hawaiian ecosystems as feral ungulates would further degrade natural habitats, alien plants would continue to spread and alter native forests, and severely endangered species populations would continue to decline. The Proposed Action would have a positive impact on these 28 endangered species and on natural communities in general.

The MIP management actions extend over the next 20 years, with the progress and adaptive management of the plan being assessed on a yearly basis with the USFWS. Through these Proposed Actions the Army would like to continue to play an active role in the conservation of Hawaiian Ecosystems on O'ahu using the MIP as a road map.

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## 1. SCOPE OF THE PROGRAMMATIC ENVIRONMENTAL ASSESSMENT.

This Programmatic Environmental Assessment (PEA) evaluates potential individual and cumulative impacts of the Proposed Action for the construction and maintenance of management units and alternatives on environmental resource areas. This document is programmatic in nature and scope, and evaluates the broad, generic impacts associated with the Proposed Action. The PEA identifies potential impacts, evaluates the potential significance of those impacts, and evaluates the mechanisms by which those impacts will be mitigated. Subsequent NEPA analysis will be tiered under this PEA, and will be prepared where site specific conditions require more detailed analyses.

## 2. PURPOSE AND NEED FOR THE PROPOSED ACTION.

The 25th ID (L) and US Army Hawai‘i (USARHAW) is proposing to conduct natural resource protection measures for 28 endangered plant taxa and one endangered snail taxon as identified in the Mākua Military Reservation Implementation Plan, 2003 (MIP). The management actions would take place in the State of Hawai‘i Natural Area Reserves, Board of Water Supply lands, Campbell Estate lands being protected by the Nature Conservancy, Army owned and leased lands in the Wai‘anae and Ko‘olau Mountains, and other privately owned lands. The purpose of the natural resource management actions is to control the threats to 28 endangered species and help these species achieve stabilization. The stabilization measures are the result of a 1999 non-jeopardy Biological Opinion issued by the US Fish and Wildlife Service (USFWS) to the Army for routine training at Mākua Military Reservation (MMR) and include fencing, alien species control, outplanting, and genetic material collections. To stabilize target taxa, each taxon must be maintained with sufficient numbers of populations to ensure their long-term viability. Additionally, threats to the managed and reproducing individuals in each population must be controlled, and each taxon must be adequately represented in an *ex situ* (out of the wild) collection. Stabilization is the first step toward the recovery of these endangered species.

## 3. DESCRIPTION OF THE PROPOSED ACTION.

The proposed action would be to conduct natural resource management actions for 28 listed plant taxa and one listed snail species. The ultimate goal of the plan is to stabilize the species. Stabilization requires that a certain population size be met (differs by type of organism and life history traits), that three populations of each taxa reach this criteria, all threats are controlled for each population, and each species is adequately represented in an *ex situ* (out of the wild) collection. To achieve stabilization the Army and a team of scientific experts identified the best population units (PUs) for management efforts and designated management units (MUs) to encompass the chosen PUs and representing the best locations to undertake ecosystem size actions. The Mākua Implementation Plan (MIP), produced by the Army, was the resulting document. Under the proposed action 22 MUs represented by 37 subunits are proposed to be managed in the Wai‘anae and Ko‘olau Mountains. Management actions would include threat abatement actions and reintroductions of endangered species into appropriate, protected habitat. Currently, five MUs that have been established on Army, State, and private land in cooperation with various State and private conservation organizations. The natural resources management outlined in the MIP is projected over the next 20 years but is acknowledged to require much longer-term conservation strategies in order to be considered successful. Year one of the MIP began in 2005.

## 3.1 Management Actions

Fencing and Ungulate Control

Using fences to create areas targeted for ungulate eradication is a well-established practice in other managed Hawaiian natural areas (Cory 2000). The fences are designed primarily to prevent further invasion of ungulates such as feral pigs, goats, and cattle (see Figure 1). Perimeter fences for the MUs typically either follow MU boundaries, or fall outside MU boundaries when topography forces the fence line to follow ridge tops or contours to avoid cliffs or other natural obstacles. Perimeter fences are typically smaller than the MU boundaries unless topographic or other features keep ungulates out of unfenced sections of the MU. In addition to perimeter fences, several fences are proposed to divide large MUs into smaller subunits, or provide a strategic protective function, such as preventing movement of feral ungulates along ridges (strategic fences). All MIP proposed fence lines are depicted in Maps 1-17 below. In very rare cases, perimeter fences are not recommended, for example when MUs include areas that are considered self-protected (typically by vertical cliffs). In these situations, short, strategic fences might be the only fences proposed. In cases where a fence crosses a trail on public lands, a crossover will be constructed to maintain easy public access. Placement and size of all MU fences would be refined based on landowner input. All proposed fence lines are approximations only, and subject to a thorough fence line scoping to determine detailed on-the-ground placement that minimizes damage to habitat and rare taxa, and optimizes protection.

Within MU fences, ungulates such as pigs, goats, and feral cattle would be removed until the MU is ungulate free. Methods for ungulate control and removal are drawn from best available control techniques from natural resource managers at the US Army Directorate of Public Works (DPW) Environmental Division, the National Park Service, US Fish and Wildlife Service National Refuges, State Natural Area Reserves, preserves of the Nature Conservancy of Hawai‘i, and others. These techniques may include public hunting, staff hunting, trapping and snaring, and other methods (Cory 2000).

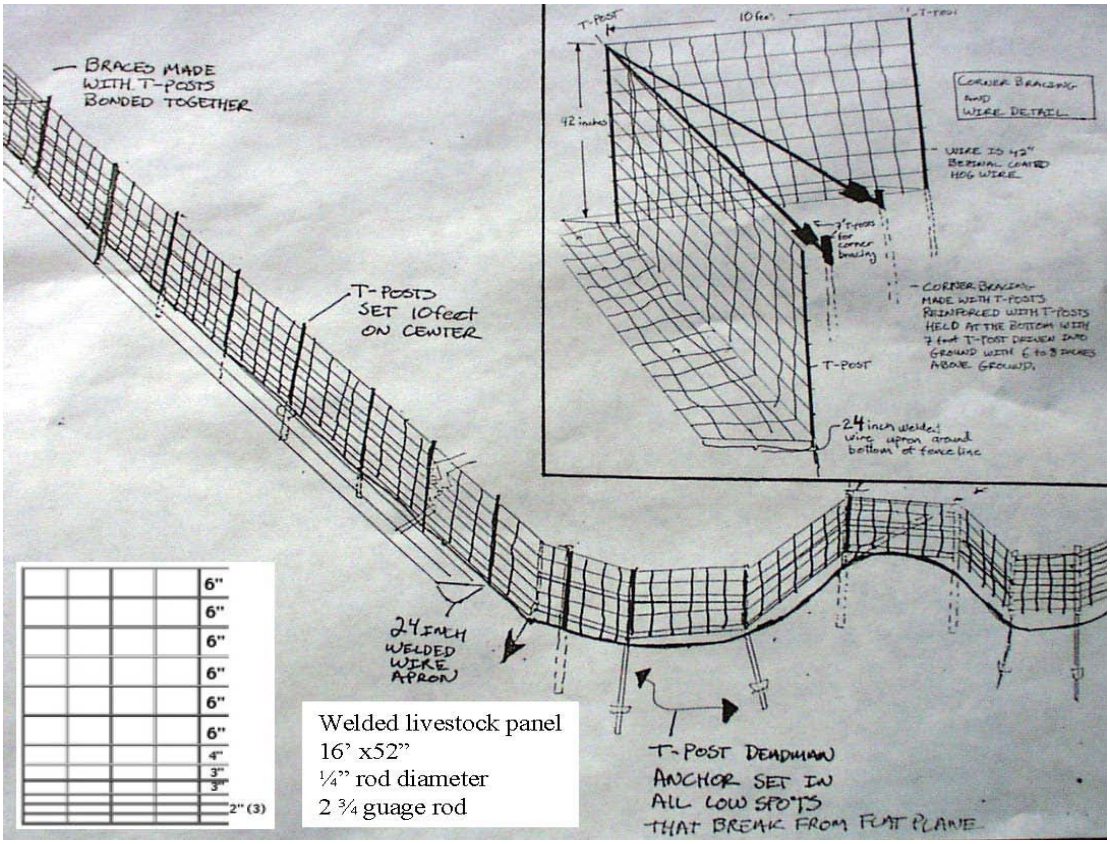



**Figure 1. Fence design details.**

Alien Plant Control

Within the MUs, the highest priority non-native vegetation are identified and designated for one of three general levels of control. Incipient habitat modifying weeds are slated for complete removal. All established and persistent weeds would be removed within a 50 meter radius of all rare plant populations. Across the MU weed cover would be reduced to 25% to 50% cover. Additionally, in high fire threat areas fuels will be removed for fire protection. Methods for weed control are continually being improved, and the Army would use the best available control techniques of natural area managers (see appendix). Generally, weed control would include the use of herbicides. Herbicides commonly used to control alien plants in MUs include: Fusilade II®, Garlon 4®, Glypro®, Glypro Plus®, Roundup Pro® (see appendix). All herbicides are used according to the respective label. In areas dominated by alien taxa, gradual, incremental weed control would be used to avoid rapid or major microhabitat changes.

Small Mammal Control

Where small mammals have been identified as a threat, small mammal control, in the form of trapping and the use of toxicants, would be implemented within MUs. The toxicant currently used is Ramik® Mini Bars with 0.005% diphacinone (see appendix). Mammal control would be focused in the vicinity of PUs and proposed reintroductions and augmentations of target taxa shown to be sensitive to small mammal predation (e.g. *Achatinella mustelina* and plants eaten by rats). Current small mammal control techniques include snap trapping and use of toxicant bait stations. The research and protocols for aerial application of rodenticides is currently being explored and may be applicable to MU management in the future.

Alien Invertebrate Control

Specific management tools are currently not available for insect pests such as two-spotted leafhopper (*Sophonia rufofascia*), black twig borer (*Xylosandrus compactus*), and Chinese rose beetle (*Adoretus sinicus*). Under certain conditions, it may be necessary to apply systemic insecticide to individual plants, which might control alien pest plants. Additionally, slugs prey on seedlings and young plants of many endangered Hawaiian species, and there is currently no toxicant approved for use in natural areas. Current research proposed by the Army includes developing control measures for slugs and potential slug exclosures around rare plant populations. If effective systemic insecticides or slug toxicants become available for use in natural areas the Army may use these within the proposed MUs in order to protect affected endangered plant species.

Alien Invertebrate Exclosures

Because the predator snail *Euglandina rosea* is a primary threat to *Achatinella mustelina*, monitoring and control measures for *E. rosea* are proposed in the population units wherever populations of *A. mustelina* are present. Since there are no approved toxicants for use in remote areas to control for these pests, protective barriers would be constructed for small areas within MUs. These exclosures are generally 20-30 m square and consist of a rigid wall of recycled plastic lumber approximately 5 feet high with the lower 15 or more centimeters buried in the earth. A 25cm shed-like roof extends outward from the top of the fence to cover two barriers against *E. rosea*: a 10 cm trough filled with coarse salt (calcium chloride or sodium chloride) and a two-wire electrical barrier. The wires, energized by a battery that is kept charged by a solar panel, are attached against the wall, one 8 mm above the other. A snail that contacts both wires receives a 12V shock, which causes it to drop backward off the wall. The rigid wall of the barrier would also serve to deter rats. It is essential that vegetation be kept cleared from the predator-exclusion barrier so that it cannot provide bridges for predators to reach the interior.

Genetic Collection of Endangered Snails and Plants

The goal of collection from the wild is to ensure that material is available for future reintroductions or augmentation efforts. Collection of snails would occur in order to represent the different evolutionary significant units defined by genetic analyses in captivity. Collection efforts would be conducted by the Army and field experts with USFWS collection permits. The methods for collection and captive propagation of snails have been refined through years of experience by Dr. Michael Hadfield, professor of malacology at the University of Hawai‘i at Mānoa. The Snail Captive Propagation Lab at the University of Hawai‘i has been propagating endangered tree snails for over 10 years.

Protocols for plant propagule collection were based on the guidelines of the Center for Plant Conservation (CPC) and the Hawai‘i Rare Plant Restoration Group (HRPRG). Both groups have worked with rare Hawaiian plant taxa and developed specific, recommended protocols for propagule collection. In the collection guidelines, a balance was struck between the need to remove seed or other living material in sufficient quantity to serve the purposes of stabilization while not harming wild plants or unduly reducing potential natural regeneration. Given the small number of populations and the small size of the populations of the endangered plants in the MIP, it was recommended that collections be made from all populations, and from up to 50 individuals

per population. In order to allow for natural regeneration in the field, it was recommended that only 20% of the available seed should be collected from each plant, unless fewer than 10 plants remain in the population. If that is the case, the amount of seed collected is up to the discretion of the collector. Collections of plant propagules will be conducted by Army Natural Resources Staff.

Reintroductions and Augmentations

Given the historical trend of reduction in geographic range, numbers of populations, and numbers of individuals of endangered taxa in Hawai‘i, one of the strategies in the stabilization of the MIP target taxa is reintroduction of individuals into suitable managed habitat within the known historical range or likely suitable habitat of a taxon. Reintroduction is defined in the MIP as establishing a number of individuals into a geographic area within a taxon's historic range that is currently not known to contain the taxon, with express purpose of establishing a sustained or growing population. Augmentation is adding individuals that have been grown *ex situ* (in captivity) or reared into a site currently occupied by the taxon. Great care would be taken to preserve the genetic integrity of the natural populations whenever augmentation is conducted. A strict sanitation protocol would be followed by the greenhouse staff to ensure that non-native weeds or other pests are not introduced into pristine areas. The MUs are the focal sites for all reintroductions and augmentations. The Army would follow the Hawai‘i Rare Plant Restoration Group's reintroduction guidelines for plants. Snails would only be reintroduced from captive reared populations into the wild after approval by an established committee of snail experts and affected parties.

Fire Control

The goal of fire control within each MUs is to bring fire threat to zero, or to minimize the threat in those areas where the threat cannot be removed entirely. This can be done by reducing fuels within the MUs and by working with the Installation Fire and Safety Office (IFSO) to reduce the fire threat for the MUs that are within or adjacent to the training areas. The Army recently compiled an Integrated Wildland Fire Management Plan (IWFMP) for the O‘ahu and Pōhakuloa Training Areas. This document outlines plans for pre-suppression, fire suppression, and post-fire suppression actions for fires in these training areas. Pre-suppression actions include education, enforcement, engineering, and ignition control. Additionally, the Army has contracted a Wildland Fire Ecology and Management Specialist to assess the fire risk for each proposed MIP MU. For all MIP MUs with assessed high fire risk a separate fire control document will be produced.

Erosion Control

Erosion would be managed when target taxa are imminently threatened. Substrate stabilization in localized areas are limited but can include ground covering of various materials and outplanting common native plants to hold the soil in place.

### 3.2 Management Unit Descriptions

The proposed management actions would take place within 22 designated MUs. The majority of these MUs would be fenced exclosures to exclude ungulates. Table 1 below outlines each MU proposed to be built and/or managed with the Army's MIP endangered species stabilization plans.

**Table 1. Army MIP Proposed Management Units**

| No. | Management Unit | Landowner | Acres | Perimeter (m) | Region |
|---|---|---|---|---|---|
| **1** | East Makaleha | State | 231 | 4360 | Waiʻanae |
| **2a** | ʻĒkahanui- subunit I | TNC | 44.8 | 1968 | Waiʻanae |
| **2b** | ʻĒkahanui- subunit II | TNC | 157.4 | 157 | Waiʻanae |
| **3a** | Haili to Keālia- subunit I | State | 20 | 1245 (unfenced) | Waiʻanae |
| **3b** | Haili to Keālia- subunit II | State | 9.6 | 1129 (unfenced) | Waiʻanae |
| **4a** | Kaʻena- subunit I Kaʻena | State | 15.8 | 1145 (unfenced) | Waiʻanae |
| **4b** | Kaʻena- subunit II East of ʻĀlau | State | 35.8 | 1917 (unfenced) | Waiʻanae |
| **5a** | Kahanahāiki- subunit I | Army | 63 | 2891 | Waiʻanae |
| **5b** | Kahanahāiki –subunit II | Army | 30 | 1686 | Waiʻanae |
| **6a** | Kaluaʻā and Waiʻeli- subunit II A | TNC | 9.4 | 885 | Waiʻanae |
| **6b** | Kaluaʻā and Waiʻeli- subunit II B | TNC | 8.2 | 815 | Waiʻanae |
| **6c** | Kaluaʻā and Waiʻeli- subunit II C | TNC | 11.6 | 977 | Waiʻanae |
| **6d** | Kaluaʻā and Waiʻeli- subunit III | TNC | 97 | 2600 | Waiʻanae |
| **7** | Kaluakauila | Army | 104 | 3609 | Waiʻanae |
| **8** | Kamaileʻunu | BWS | 5 | 562 | Waiʻanae |
| **9** | Keaʻau and Mākaha | State/BWS | 5 | 671 | Waiʻanae |
| **10** | Lower ʻŌhikilolo | Army | 70 | 3052 (strategic fence) | Waiʻanae |
| **11** | Lower Peʻahināiʻa | Kamehameha Schools | 17 | 1239 | Koolau |
| **12a** | Mākaha - subunit I | BWS | 95 | 2658 | Waiʻanae |
| **12b** | Mākaha - subunit II | BWS | 66 | 2880 | Waiʻanae |
| **12c** | Mākaha - subunit III | BWS | 0.6 | 222 | Waiʻanae |
| **13** | Manuwai | State | 166 | 3563 | Waiʻanae |
| **14** | ʻŌhikilolo | Army | 578 | 11400 | Waiʻanae |
| **15** | Pahole | State | 215 | 4042 | Waiʻanae |
| **16a** | Palikea IA | TNC | 21 | 1505 | Waiʻanae |
| **16b** | Palikea IB | TNC | 11 | 998 | Waiʻanae |
| **16c** | Palikea IV | TNC | 1.8 | 364 | Waiʻanae |
| **16d** | Palikea V | TNC | 3.5 | 610 | Waiʻanae |
| **17** | Puʻu Kūmakaliʻi | Army | 28 | 2031 (unfenced) | Waiʻanae |
| **18a** | Upper Kapuna -subunit I | State | 24 | 1504 | Waiʻanae |
| **18b** | Upper Kapuna- subunit II | State | 8 | 879 | Waiʻanae |
| **18c** | Upper Kapuna- subunit III | State | 18 | 1361 | Waiʻanae |
| **18d** | Upper Kapuna- subunit IV | State | 207 | 4420 | Waiʻanae |
| **19** | Waiʻanae Kai | State | 9 | 771 | Waiʻanae |
| **20** | Waiawa | Kamehameha Schools | 124 | 2936 | Koolau |
| **21** | West Makaleha | State | 93 | 2768 | Waiʻanae |
| | | **Total acreage** | **2603.5** | | |

### 3.2.1 Management Units on Army Lands

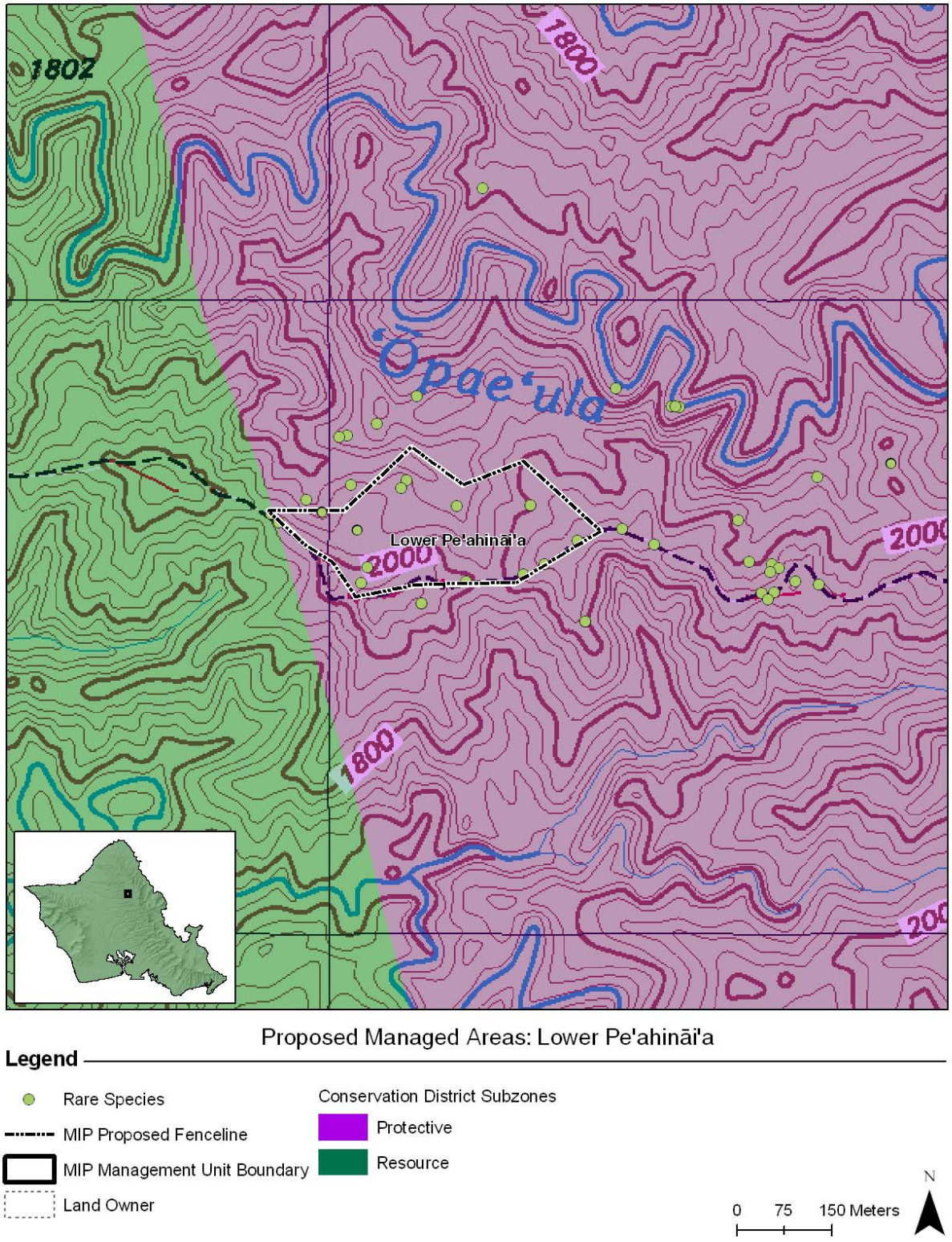
Lower Peʻahināiʻa- This is the only MIP MU proposed for the Kawailoa training area (KLOA) and is located on a parcel that is owned by Kamehameha Schools and is leased by the Army (see Maps 1 and 2). This MU is located on the ridge between Helemano and ʻŌpaeʻula streams in the middle elevation of KLOA and includes a portion of the old Peʻahināiʻa trail. The proposed managed area covers approximately 17 acres of mesic, Koa-dominated forest in the south-central portion of the training area (see Figure 2). Current management for this area is limited to rare plant collections due to the desire to focus management efforts within fenced MUs. However, the Army plans to build this MU within the next year with the Koʻolau Mountains Watershed Partnership (KMWP). Several endangered species are found within this proposed MU and are listed in Table 2.

**Figure 2.** This photo shows habitat typical of the Lower Peʻahināiʻa MU. Forest canopy is dominated by Koa (*Acacia koa*) and ʻŌhiʻa (*Metrosideros polymorpha)*.

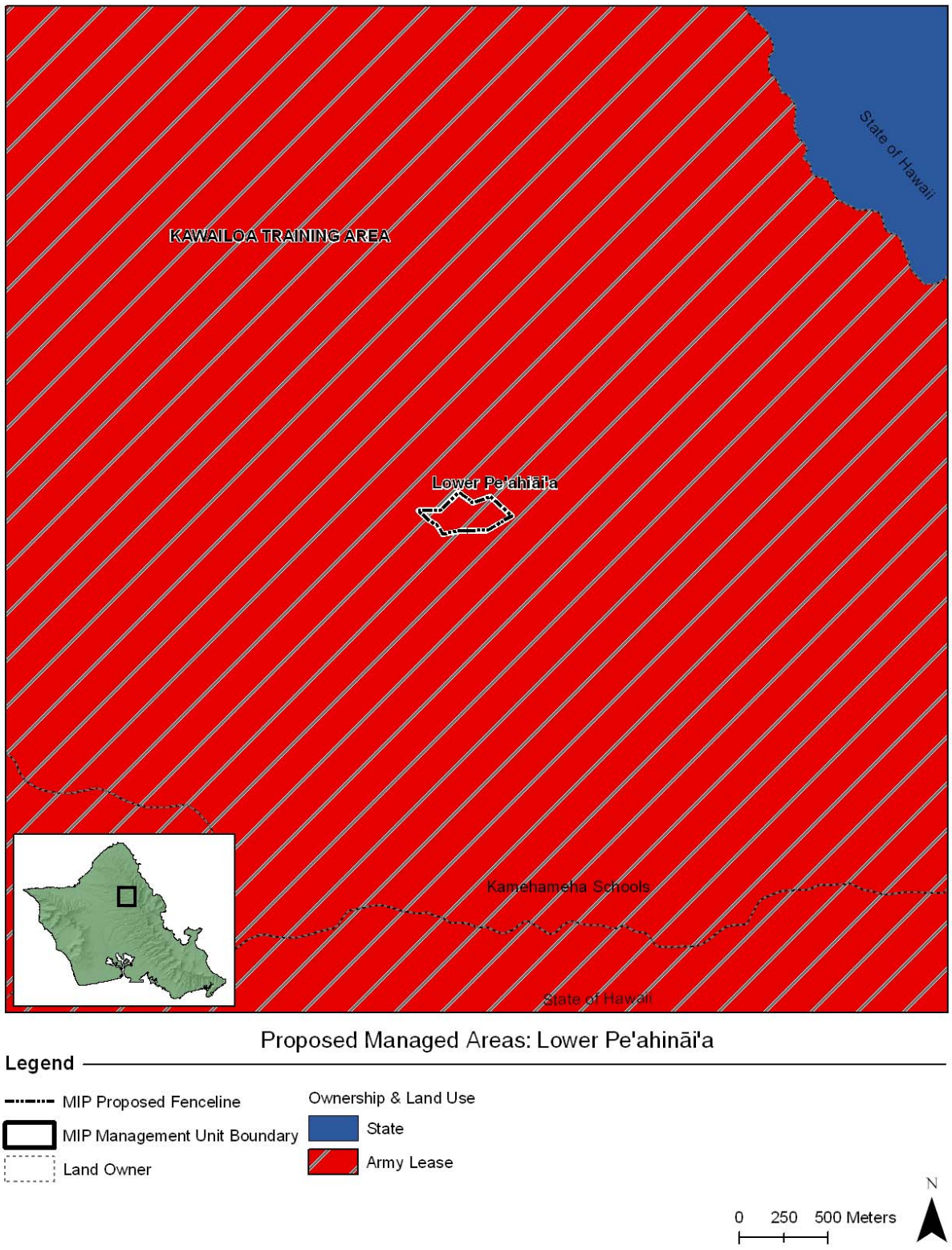
**Table 2. Rare Species Found within the proposed Lower Peʻahināiʻa MU***

| Scientific Name | Common Name | Federal Status[1] |
|---|---|---|
| **Plants** | | |
| *Cyrtandra dentata* | Haʻiwale, Kanawao keʻokeʻo | E |
| *Cyanea calycina* | Häha | |
| *Melicope lydgatei* | Alani | E |
| *Phyllostegia hirsuta* | | E |
| *Gardenia mannii* | Nānū, nāʻū | E |
| **Animals** | | |
| *Achatinella sowerbyana* | Pupu Kuahiwi, Pupu Kaniʻoe, Kahuli, Oʻahu Tree Snail | E |

*Source: Implementation Plan, Mākua Military Reservation, Island of Oʻahu. 2003.
[1]Key to Federal Status: E = endangered; C = candidate for listing; SOC = species of concern




**Map 1. The proposed Lower Peʻahināiʻa MU in the Kawailoa Training Area.**




**Map 2. Ownership and land use for proposed Lower Peʻahināiʻa MU within the Kawailoa Training Area.**

Kaluakauila- The Kaluakauila MU is located on Army land to the north of Mākua Valley (see Maps 3 & 4). This MU is currently fenced and encloses 104 acres of native remnant dry forest on the northern side of MMR (Figure 3). This MU contains a number of rare plant species and active management is currently conducted here by the Army. The rare plant species found within this MU and the other MUs on MMR is listed in Table 3. Management includes maintenance of ungulate fencing, alien plant control, small mammal control, genetic collection of rare plants, reintroductions of rare plants, and fire control. A portion of this MU was affected by fire in 2003.

**Figure 3.** This photo shows the dry forest habitat that is protected within Kaluakauila MU. Also shown in the foreground is the alien grass-dominated habitat which claims areas burned by wildfires.

Kahanahāiki (Subunits I and II)- Located in the upper northeast end of Mākua Valley both MUs lie entirely within MMR (see Maps 3 & 4). The Kahanahāiki subunit I MU was fenced in 1997. This 63 acre MU encompasses mixed native mesic forest and is currently a site of active rare species and ecosystem management. Current management includes ungulate fencing, alien plant control, alien invertebrate exclosures, small mammal control, genetic collection of rare plants, and reintroductions/augmentations of rare plants.

Kahanahāiki subunit II MU is adjacent and to the west of subunit I and is comprised of roughly the same type of habitat. The Army hopes to fence subunit II in the near future. Currently, active management in subunit II includes genetic collections of endangered species for propagation, a reintroduction site for *Euphorbia haeleeleana*, and small scale ungulate control. Once, this subunit is fenced this active management would expand to include reintroductions/augmentations of rare plant species.

**Figure 4.** The forested slope just beyond the dead trees in the foreground is the Kahanahāiki Subunit II MU. Major tree components include *Diospyros sandwichensis* and *Metrosideros polymorpha*.

<u>ʻŌhikilolo</u>- The ʻŌhikilolo MU is by far the largest MU proposed, with greater than 577 acres of habitat protected from ungulates. This MU is located entirely within MMR and encompasses various habitats from dry forest to mixed mesic forest (see Maps 3 & 4). This area is currently fenced to exclude goats. Goats within the fenced MU have almost been eradicated. This MU actively managed on the ecosystem and rare species levels. However, a large portion of this MU encompasses very steep cliffs that are not actively managed (see Figure 5). The rare species found within this MU and the other MUs within MMR are listed in Table 3.

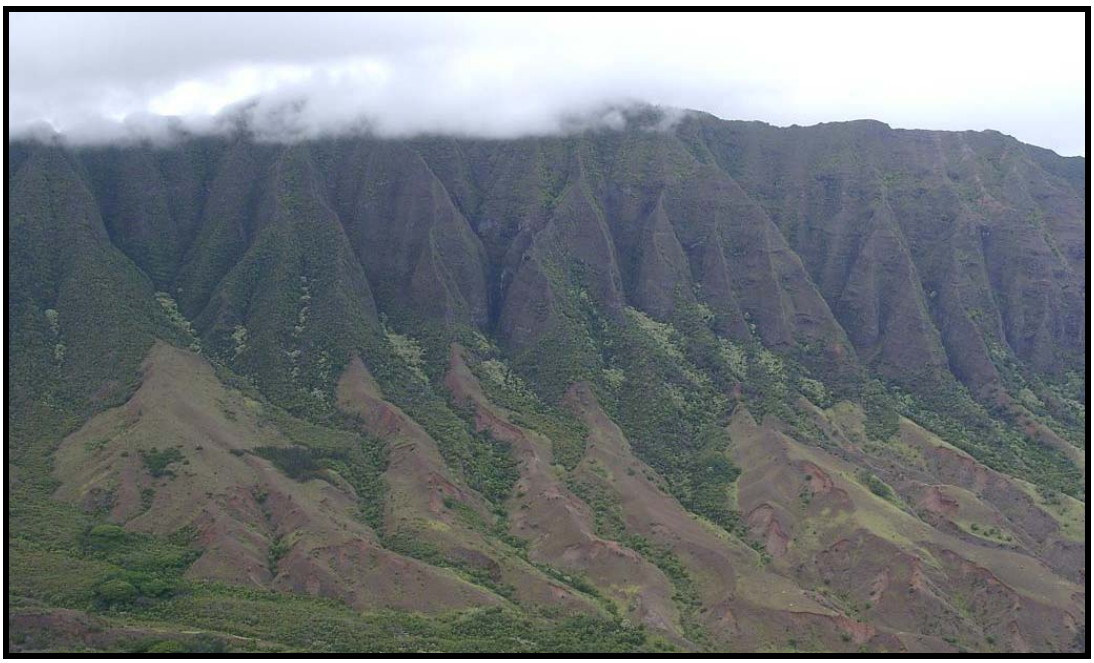
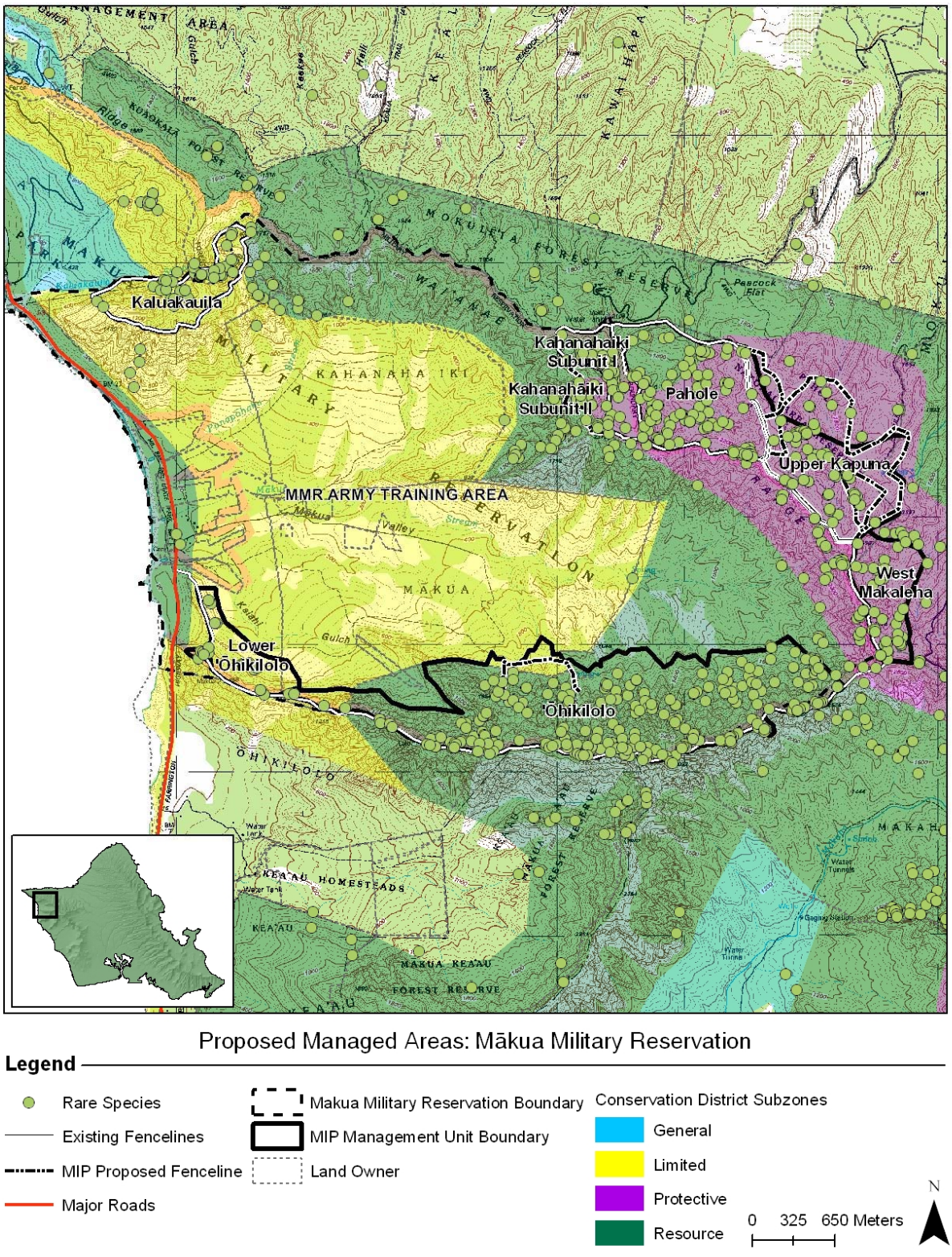


**Figure 5.** A view of the ʻŌhikilolo MU from the north side of Mākua Valley looking south. The large vertical cliffs are the main habitat type within this MU. These are sparsely vegetated but

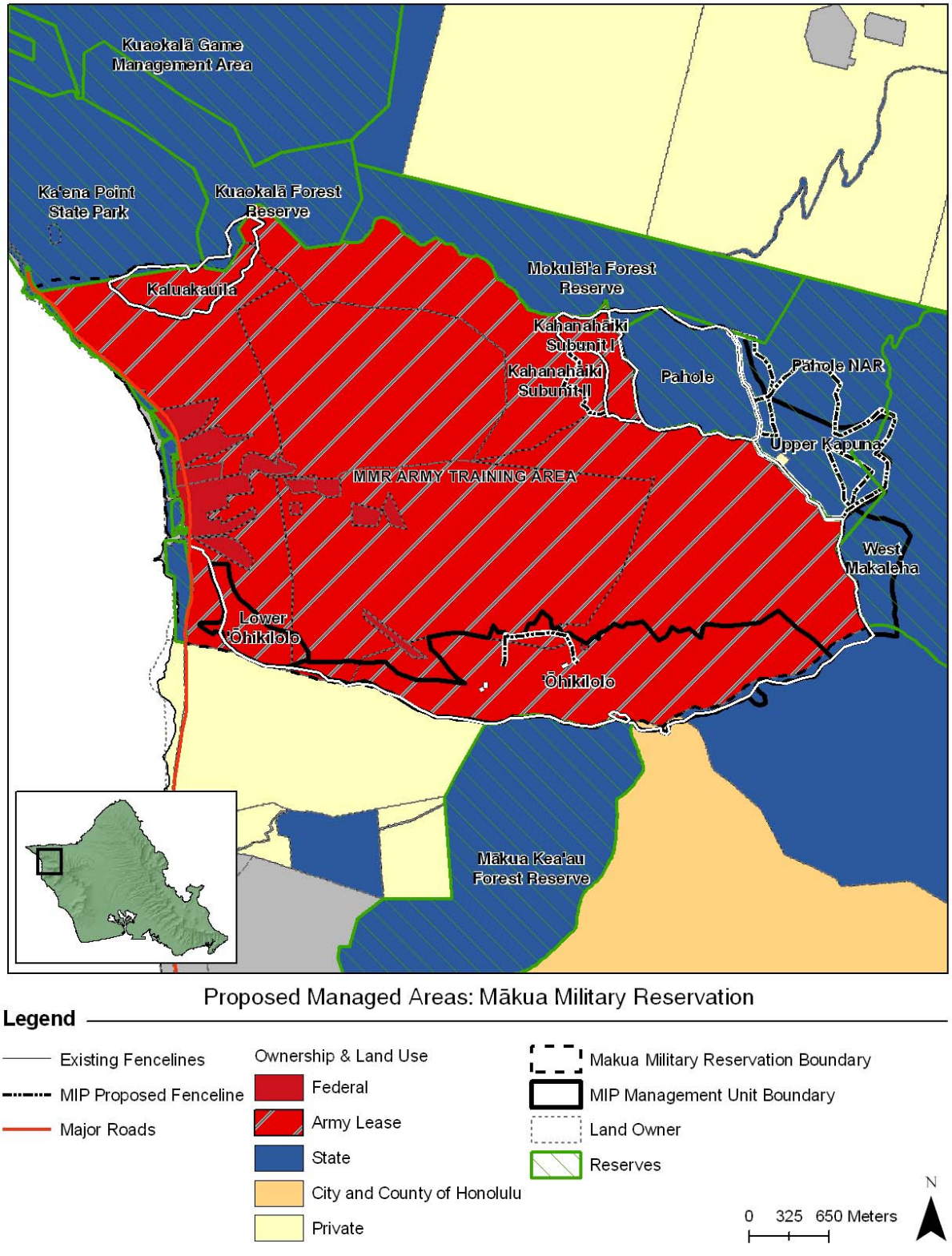
contain many rare native plants. The forested area within the clouds along the ridgeline and at the base of the cliffs is less steep.

Lower ʻŌhikilolo- The Lower Ōhikilolo MU is situated near the mouth of Mākua Valley within MMR (see Maps 3 & 4). This MU was created to protect wild populations of two endangered species. It contains dry native and alien communities. Strategic fencing has been constructed here to protect a portion of this MU which lies outside the large ʻŌhikilolo fence but is not enclosed entirely. The ʻŌhikilolo ridge fence protects most of the MU from ungulates. Active management in this MU includes the control of fire prone grasses and shrubs and the collection of propagules from endangered plant species for genetic storage.

**Figure 6.** This photo shows the *Chamaesyce celastroides* var. *kaenana* population within the Lower ʻŌhikilolo MU. This habitat is characteristically alien grass-dominated. This photo was taken from the MU looking north toward Kaluakauila.




**Map 3. The proposed and existing management units within or adjacent to Mākua Military Reservation.**




**Map 4. Ownership, land use, and forest reserve boundaries for the proposed and existing management units within or adjacent to Mākua Military Reservation.**

**Table 3. Rare Species found in the existing and proposed MUs within Mākua Military Reservation: Kaluakauila, Kahanahāiki, ʻŌhikilolo and Lower ʻŌhikilolo.***

| Scientific Name | Common Name | Federal Status[1] |
|---|---|---|
| **Plants** | | |
| *Alectryon macrococcus* var. *macrococcus* | Alaʻalahua, Mahoe | E |
| *Bonamia menziesii* | | E |
| *Cenchrus agrimonioides* var. *agrimonioides* | Kāmanomano | E |
| *Chamaesyce celastroides* var. *Kaʻenana* | ʻAkoko | E |
| *Ctenitis squamigera* | Pauoa | E |
| *Cyanea superba* subsp. *superba* | Hāhā, Ohawai | E |
| *Cyrtandra dentata* | Haʻiwale | E |
| *Delissea subcordata* | Hāhā, Ohawai | E |
| *Diellia falcata* | | E |
| *Dubautia herbstobatae* | Naʻenaʻe | E |
| *Euphorbia haeleeleana* | | E |
| *Flueggea neowawraea* | Mehamehame | E |
| *Hedyotis degeneri* var. *degeneri* | | E |
| *Hibiscus brackenridgei* subsp. *Mokulēiʻanus* | Maʻo hau hele | E |
| *Lipochaeta tenuifolia* | Nehe | E |
| *Neraudia angulata* | Maʻaloa, Maʻoloa, ʻOloa | E |
| *Nesoluma polynesicum* | Keahi | SOC |
| *Nototrichium humile* | Kuluʻī | E |
| *Plantago princeps* var. *princeps* | Ale, Laukahi kuahiwi | E |
| *Platydesma cornuta* var. *decurrens* | Pilo kea | C |
| *Pleomele forbesii* | Halapepe | C |
| *Pritchardia kaalae* | Loulu | E |
| *Pteralyxia macrocarpa* | Kaulu | C |
| *Sanicula mariversa* | | E |
| *Schiedea nuttallii* | | E |
| *Schiedea obovata* | | E |
| *Tetramolopium filiforme* | | E |
| *Viola chamissoniana* subsp. *chamissoniana* | | E |
| **Animals** | | |
| *Achatinella mustelina* | Pupu Kuahiwi, Pupu Kaniʻoe, Kahuli, Oʻahu Tree Snail | E |
| *Asio flammeus sandwichensis* | Pueo, short-eared owl | SOC |
| *Chasiempis sandwicensis* subsp. *ibidis* | Oʻahu ʻElepaio | E |
| *Lasiurus cinereus semotus* | Hawaiian hoary bat | E |

*Source: Implementation Plan, Mākua Military Reservation, Island of Oʻahu. 2003.
[1]Key to Federal Status: E = endangered; C = candidate for listing; SOC = species of concern

Puʻu Kūmakaliʻi -There is one proposed management unit partially within the Schofield Barracks Military Reservation West Range (SBMR) boundary, called Puʻu Kūmakaliʻi (see Maps 5 & 6). No fence is proposed for the area because it is not currently threatened by ungulates due to the extremely steep terrain in the MU. The area is generally inaccessible and

rarely visited by people. Rare species within the MU are the endangered plants Kuhi‘aikamo‘owaihie (*Lobelia niihauensis*), *Tetramalopium filiforme*, and *Viola chamaissoniana* subsp. *chamissoniana* and the endangered Kāhuli or Püpü Kani‘oe tree snail, *Achatinella mustelina*. The area proposed for management includes approximately 12 acres along the south ridgeline of SBMR (see Figures 8 and 9).

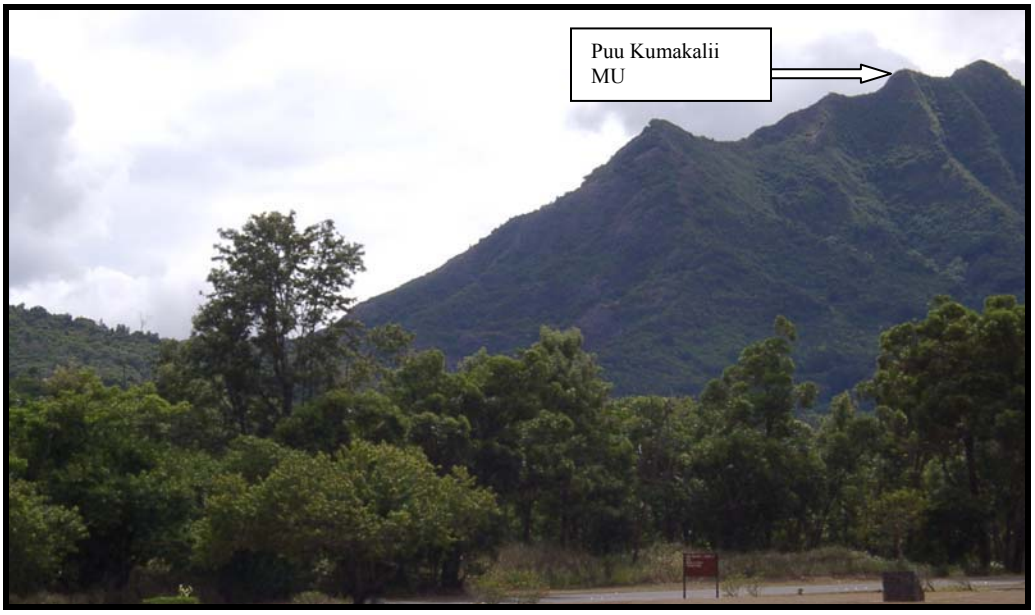
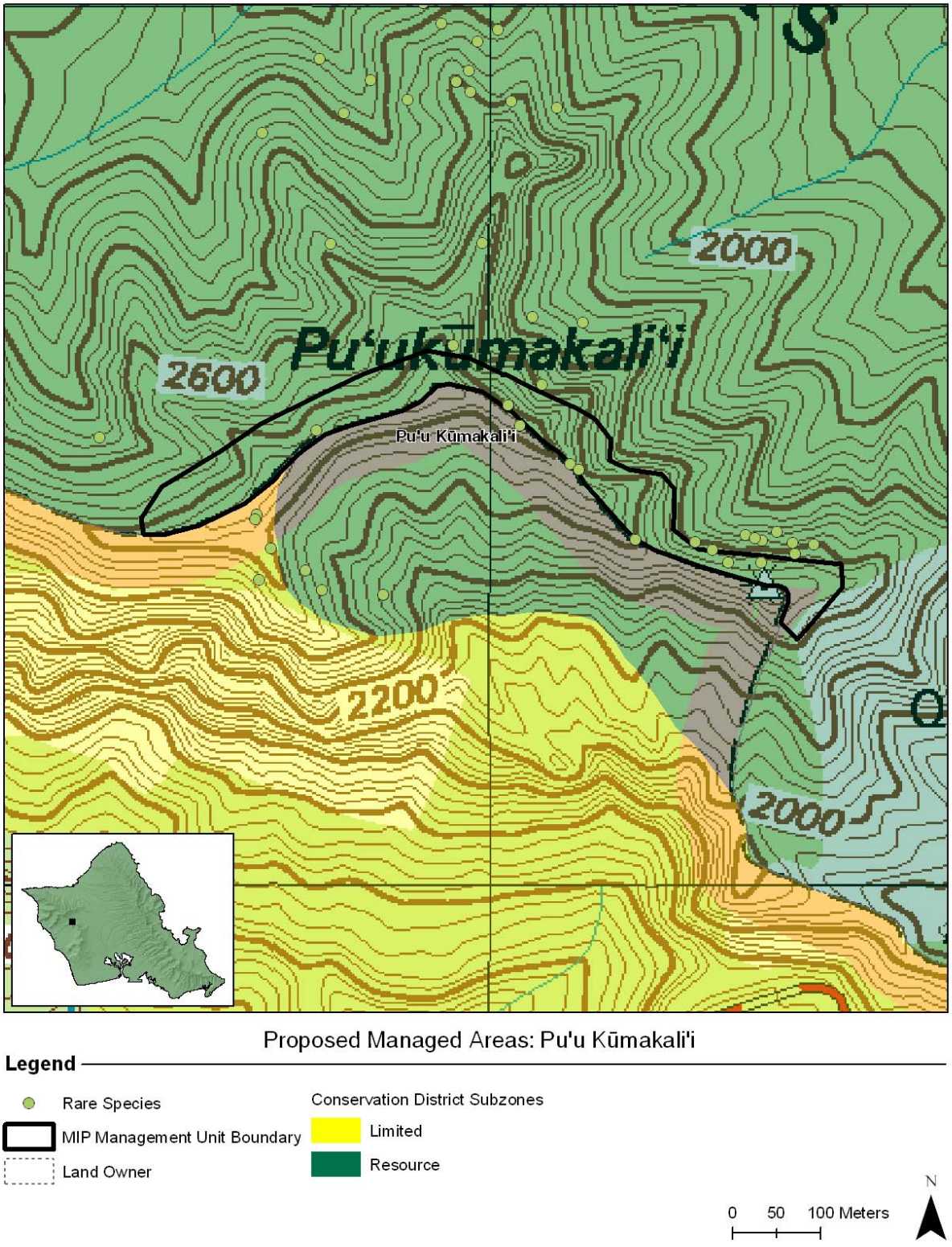
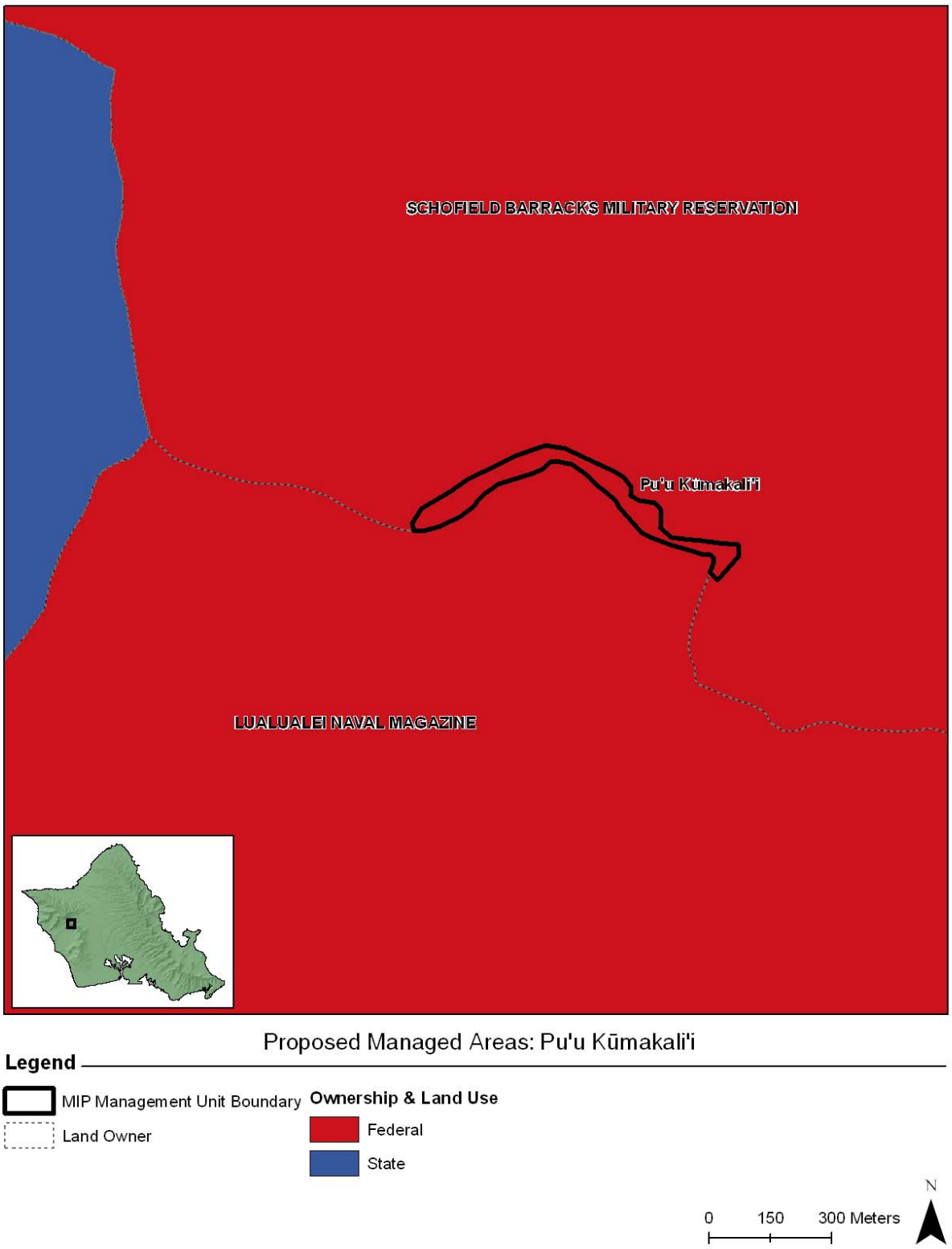



**Figure 7.** View of Pu‘u Kūmakali‘i MU on the right hand side of the photo. The steepness of the terrain is evident in the photo. Kolekole Pass is the big dip to the south on the left.


**Figure 8.** This photo is a view of the cliff system at the Pu‘u Kūmakali‘i MU, see arrow. Rare plant species found in this MU occur on these cliffs.




**Map 5. The proposed Puʻu Kümakaliʻi management unit within the Schofield Barracks Military Reservation.**




**Map 6. Ownership and land use for the proposed Puʻu Kūmakaliʻi management unit within SBMR and bordering Lualualei.**

### 3.2.2 Management Units in Mākaha and Kea‘au Valleys

Mākaha (I-III)- Mākaha Valley is owned and managed by the Honolulu Board of Water Supply (BWS) (see Maps 7 & 8). The Mākaha subunit I MU will be fenced as part of the Mākaha EA, which was approved in October 2005 (Figure 10). This subunit will encompass 95 acres of native mixed mesic forest and will be constructed in 2006. Subunit II will be adjacent to subunit I and will encompass approximately 66 acres (Figure 10 and 11). Subunit III was designed to protect two rare plant species occurring in dry, rocky cliff habitat (Figure 12). This subunit will be less than one acre. The rare species found within this MU are listed in Table 4.

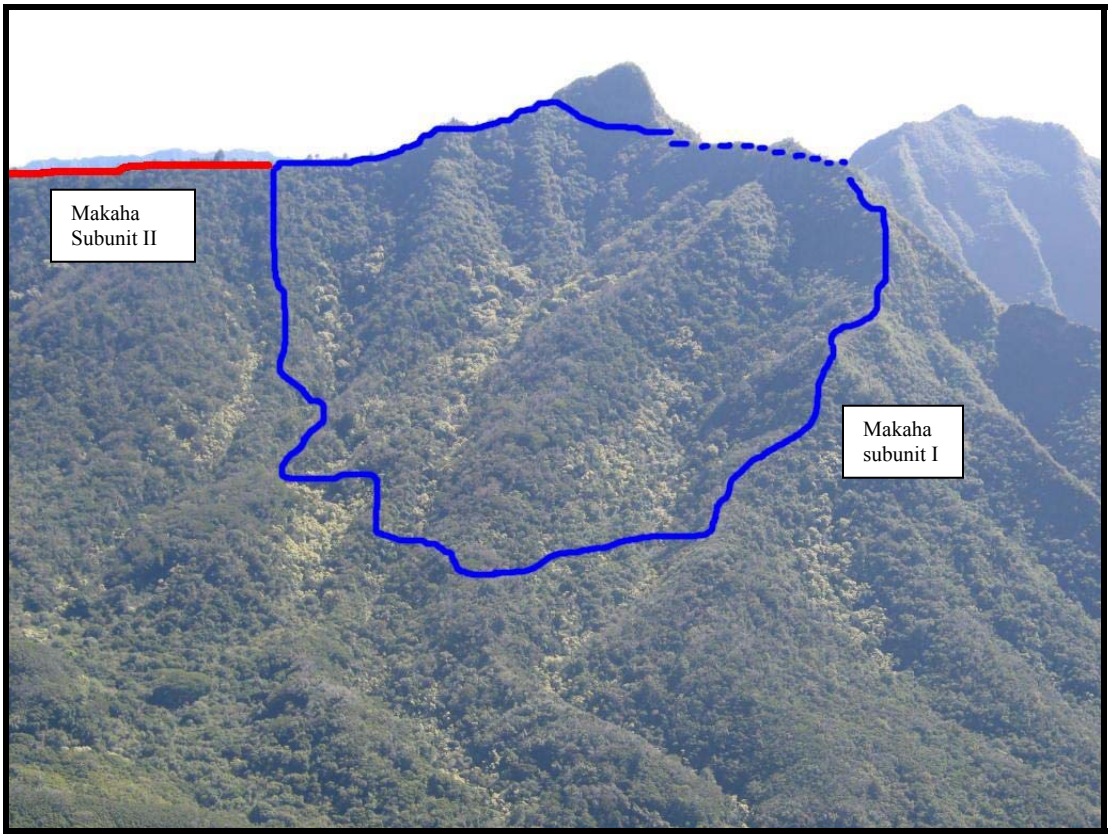



**Figure 9.** View of Mākaha subunits I (blue) and subunit II (red) looking south.

**Figure 10.** This photo shows the northern forested slope of Kūmaipō ridge which will be encompassed within the Mākaha Subunit II.

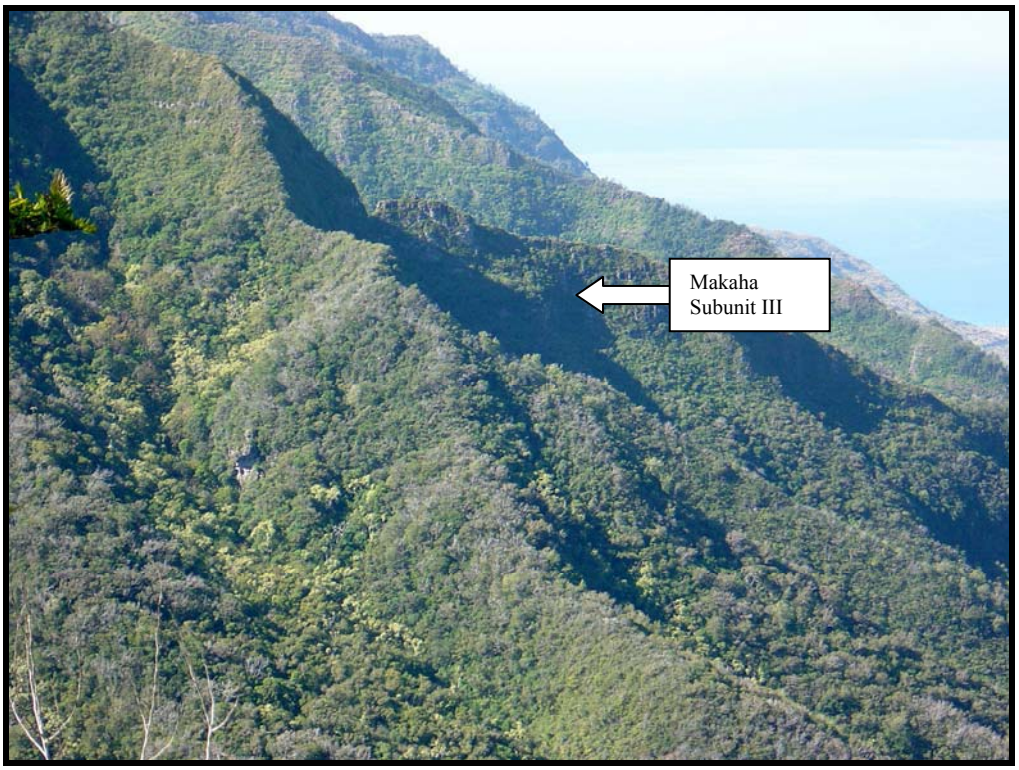


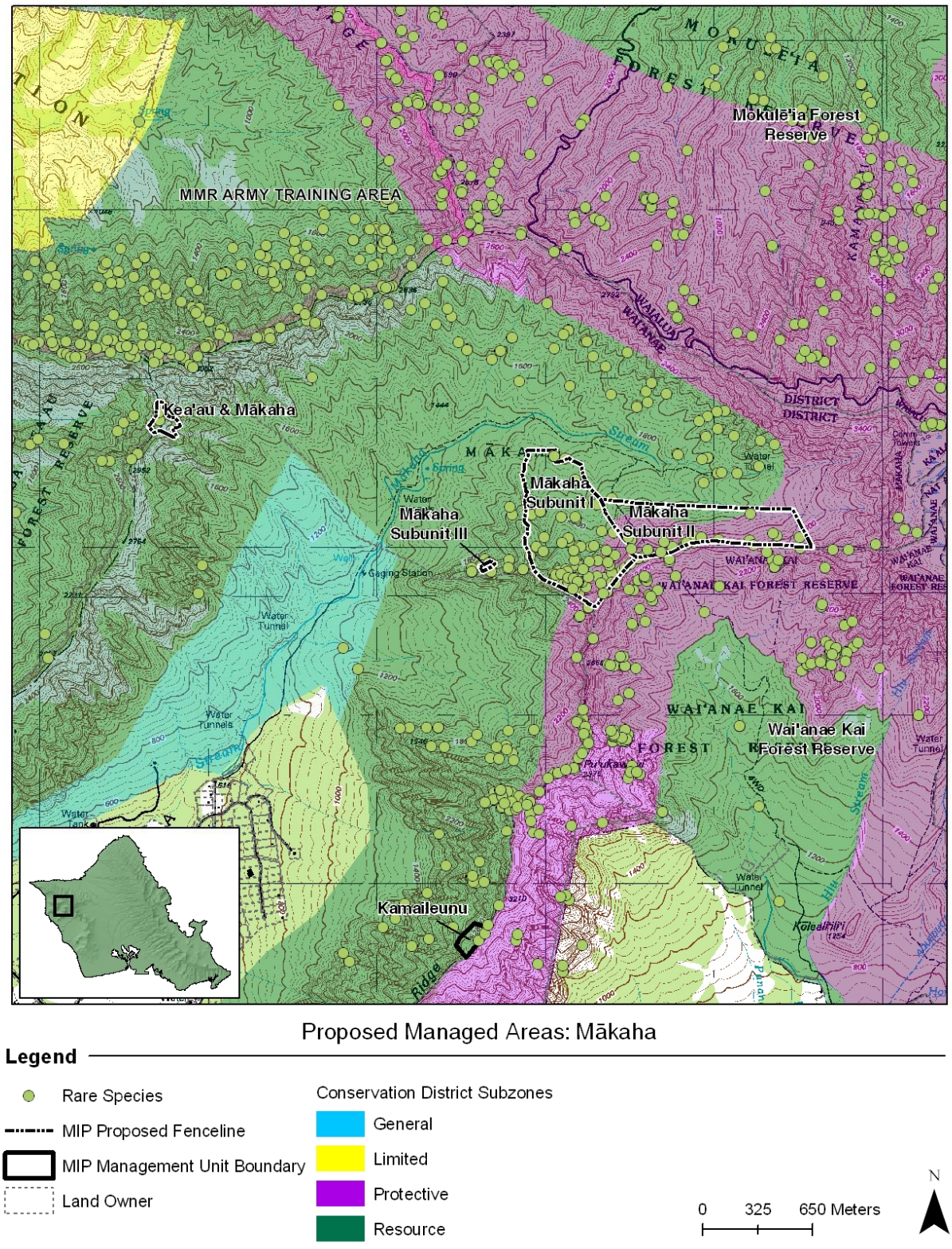

**Figure11.** The photo above shows the area in Mākaha where the Subunit III is proposed.

Kea‘au & Mākaha - This MU occurs on the boundary between Kea‘au and Mākaha Valleys just outside the south boundary of Mākua Valley and MMR. This small MU protects the single rare

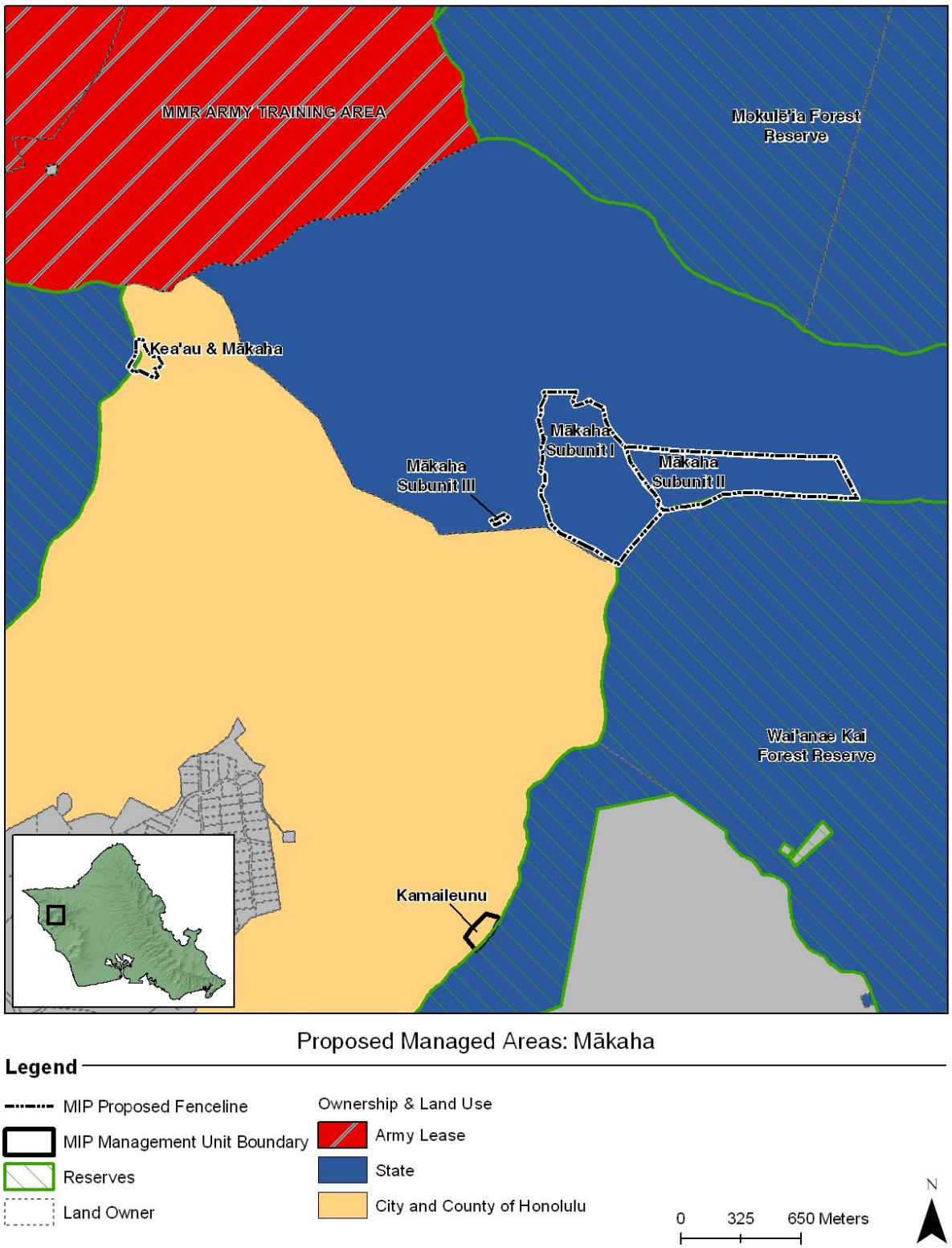
plant species *Sanicula mariversa*, which occurs in deep, soft soil areas just above cliffs. Proposed management actions for this small MU include fencing, and genetic storage collections.

Kamaileʻunu- This small MU is located along the dry, exposed cliff face of Kamaileʻunu ridge, which separates Mākaha and Waiʻanae Kai valleys in the Waiʻanae Mountains (see Maps 7 & 8). This MU protects cliff habitat for the single rare plant species *Sanicula mariversa* and occurs within Mākaha Valley. Proposed management actions for this small MU include fencing, and genetic storage collections.

**Figure 12.** A view from the Kamaileʻunu MU. The steep nature of the terrain is evident in this photo. The staff member in the photo is monitoring the endangered plant species *Sanicula mariversa* to be protected within the MU.




**Map 7. The proposed Mākaha, Kea‘au and Māhaka, and Kamaile‘unu management units.**




**Map 8. Ownership, land use, and forest reserve boundaries in Mākaha and Kea‘au Valleys.**

**Table 4. Rare species found in the proposed Mākaha management unit in the proposed management units Mākaha, Kea'au and Mākaha, and Kamaile'unu on land managed by the Board of Water Supply.***

| Scientific Name | Common Name | Federal Status[1] |
|---|---|---|
| **Plants** | | |
| *Abutilon sandwicensis* | | E |
| *Alectryon macrococcus* var. *macrococcus* | Ala'alahua, Mahoe | E |
| *Cenchrus agrimonioides* var. *agrimonioides* | Kāmanomano | E |
| *Cyanea longiflora* | Hāhā, Ohawai | E |
| *Cyanea grimesiana* subsp. *obatae* | Hāhā, Ohawai | |
| *Dubautia herbstobatae* | Na'e na'e | E |
| *Dubautia sherffiana* | Na'e na'e | SOC |
| *Eragrostis fosbergii* | | E |
| *Flueggea neowawraea* | Mehamehame | E |
| *Gouania meyenii* | | E |
| *Hedyotis degeneri* var. *degeneri* | | E |
| *Hesperomannia arbuscula* | | E |
| *Isodendrion laurifolium* | | E |
| *Lipochaeta tenuifolia* | Nehe | E |
| *Melicope mākahae* | 'Alani | SOC |
| *Neraudia angulata* | Ma'aloa, Ma'oloa, 'Oloa | E |
| *Nototrichium humile* | Kulu'ī | E |
| *Pteralyxia macrocarpa* | Kaulu | |
| *Sanicula mariversa* | | E |
| *Sicyos lanceoloidea* | | SOC |
| *Tetramolopium filiforme* | | E |
| *Viola chamissoniana* ssp. *chamissoniana* | | E |
| **Animals** | | |
| *Achatinella mustelina* | Püpü Kuahiwi, Püpü Kani'oe, Kāhuli, O'ahu Tree Snail | E |
| *Amastra spirozona* | | SOC |
| *Chasiempsis sandwicensis* subsp. *ibidis* | O'ahu 'Elepaio | E |

*Source: Implementation Plan, Mākua Military Reservation, Island of O'ahu. 2003.
[1]Key to Federal Status: E = endangered; C = candidate for listing; SOC = species of concern

### 3.2.3 Management Units with portions on State of Hawaii Lands

Pahole- This MU is located within the State of Hawaii (State) Pahole Natural Area Reserve (NAR) (see Maps 3 & 4). This MU is fenced and encompasses 215 acres of native mixed mesic forest. This MU is adjacent to the Army's existing Kahanahāiki subunit I fence. The Army has and will continue to work with the State in both rare species and ecosystem level management here. Current management includes ungulate fencing, alien plant control, alien invertebrate exclosures, small mammal control, genetic collection of rare plants, and reintroductions/augmentations of rare plants (Table 5). All current and proposed actions by the Army are coordinated and conducted in cooperation with the State.

Upper Kapuna Subunits I-IV- The Upper Kapuna MUs would protect native mixed mesic forest and are also located within the Pahole NAR (Maps 3 & 4). Subunits I and II are adjacent, on the east, to the existing Pahole MU and are currently being built by the State. These two subunits will encompass 24 and 9 acres respectively. As for subunits III and IV, the Army and the State will work cooperatively to build either the smaller subunit III (18 acres) or the larger subunit IV (a total of 208 acres to encompass subunits I-III). The decision to build either subunit will take into account both parties budgetary constraints. Currently, the western portion of subunit IV is fenced as part of the MMR boundary fenceline. The Army has been working with the State to do some alien plant control, and genetic collections in the Upper Kapuna MUs. Rare species within this MU are listed in Table 5.

West Makaleha- This MU would encompass 93 acres of native mixed mesic forest. The western portion is within the Pahole NAR and the eastern portion is within the State's Mokulēʻia Forest Reserve (see Maps 3 & 4). This MU also borders MMR on the west and the MMR boundary fenceline. Figure 7 shows the upper elevations of the proposed MU. At this time ungulate fence does not completely surround this MU. However, there are two existing fences within this MU. Each of these existing fences protects just over three acres of habitat for the endangered plant species *Schiedea obovata* and *Cyanea grimesiana* subsp. *obatae*, and reintroductions of *Cyanea longiflora* and *Delissea subcordata* (see Table 5). Current management in the West Makaleha MU is limited to alien plant and animal control within the existing fences and some ungulate control via staff hunting in the lower elevations of the proposed MU boundary. The lower portions of this MU are also open to public hunting. Because this MU is located entirely on State land, all current and proposed actions are coordinated and conducted in cooperation with the State.

**Figure 13.** Habitat to be protected in the West Makaleha fence. Looking at the ridge which is the southern most boundary of the proposed exclosure.

**Table 5. Rare species found within the proposed management units on State land: Pahole, Upper Kapuna, and West Makaleha. ***

| Scientific Name | Common Name | Federal Status[1] |
|---|---|---|
| Plants | | |
| *Alectryon macrococcus var. macrococcus* | Ala‘alahua, Mahoe | E |
| *Cenchrus agrimonioides var. agrimonioides* | Kāmanomano | E |
| *Chamaesyce herbstii* | ‘Akoko | E |
| *Cyanea grimesiana subsp. obatae* | Hāhā, Ohawai | E |
| *Cyanea longiflora* | Oha, haha, ohawai | E |
| *Cyrtandra dentata* | | E |
| *Delissea subcordata* | Hāhā, Ohawai | E |
| *Flueggea neowawraea* | Mehamehame | E |
| *Hedyotis degeneri var. degeneri* | | E |
| *Hesperomannia arbuscula* | | E |
| *Phyllostegia kaalaensis* | | E |
| *Plantago princeps var. princeps* | Ale, Laukahi kuahiwi | E |
| *Sanicula mariversa* | | E |
| *Schiedea kaalae* | | E |
| *Schiedea nuttallii* | | E |
| *Schiedea obovata* | | E |
| **Animals** | | |
| *Achatinella mustelina* | Pupu Kuahiwi, Pupu Kani‘oe, Kahuli, O‘ahu Tree Snail | E |

*Source: Implementation Plan, Mākua Military Reservation, Island of O‘ahu. 2003.
[1]Key to Federal Status: E = endangered; C = candidate for listing; SOC = species of concern

Ka‘ena Subunits I and II- This MU is located along the north coast of the Wai‘anae mountain range at the westernmost tip of O‘ahu and falls within the Ka‘ena NAR (see Maps 9 & 10). The MU is divided between two subunits encompassing coastal strand and shrub habitat and is not proposed to be fenced. Subunit I is approximately 16 acres. Both subunits were designed to protect individuals and habitat for the rare plant ʻAkoko (*Chamaesyce celastroides* var. *kaenana*). The terrain and habitat typical of subunit I is depicted below in Figure 14.

The Ka‘ena subunit II, also known as Ka‘ena East of ‘Ālau, is located along the north coast of the Wai‘anae Mountain Range. This MU is not proposed to be fenced and would include 35 acres of native coastal strand and mixed native and alien dry shrubland. Proposed management actions for this MU includes alien plant control and genetic collection of rare plant material for long-term storage and propagation.

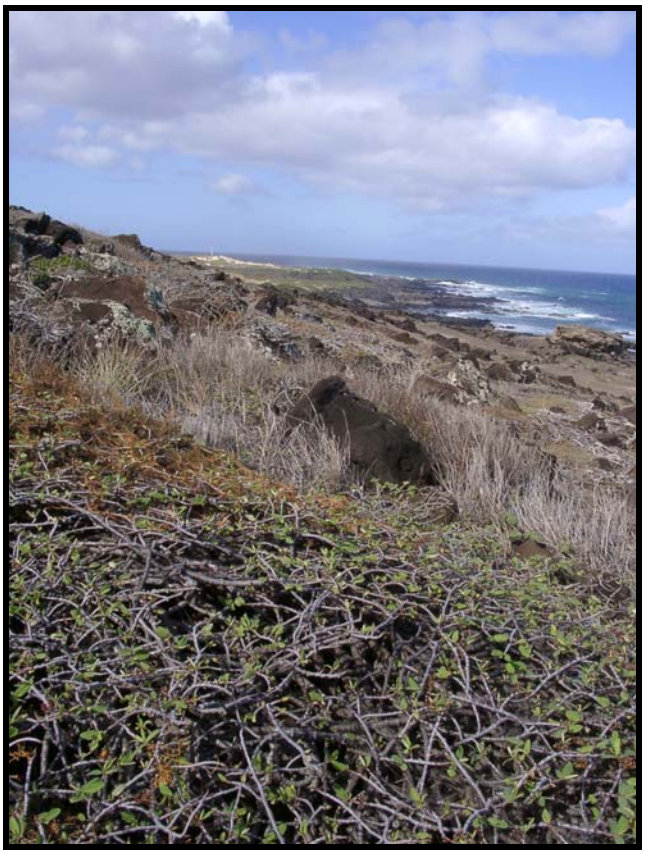
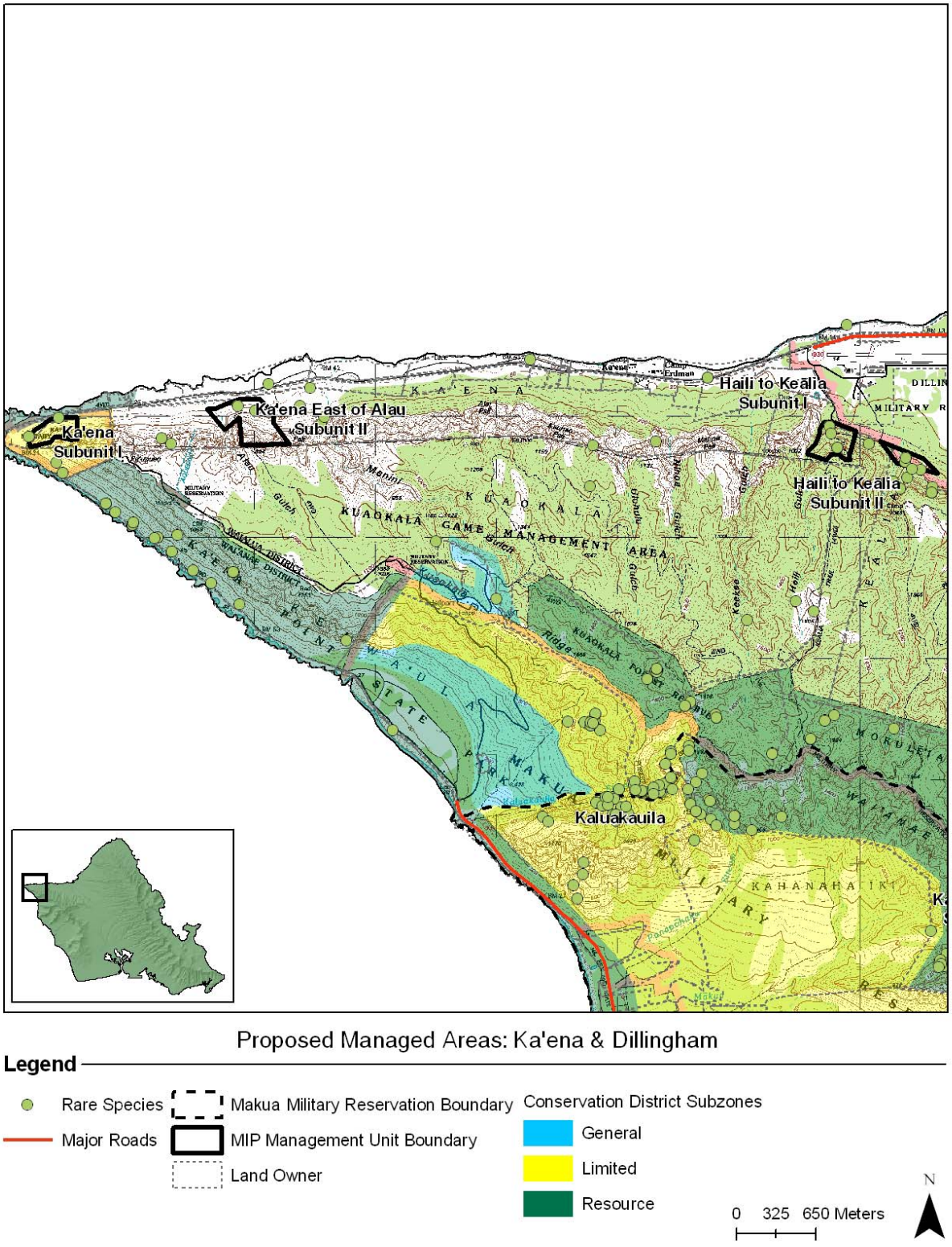


**Figure 14.** View of the habitat typical of the Ka‘ena Subunit I MU. *Chamaesyce celastroides* var. *kaenana* is the prostrate shrub in the foreground.

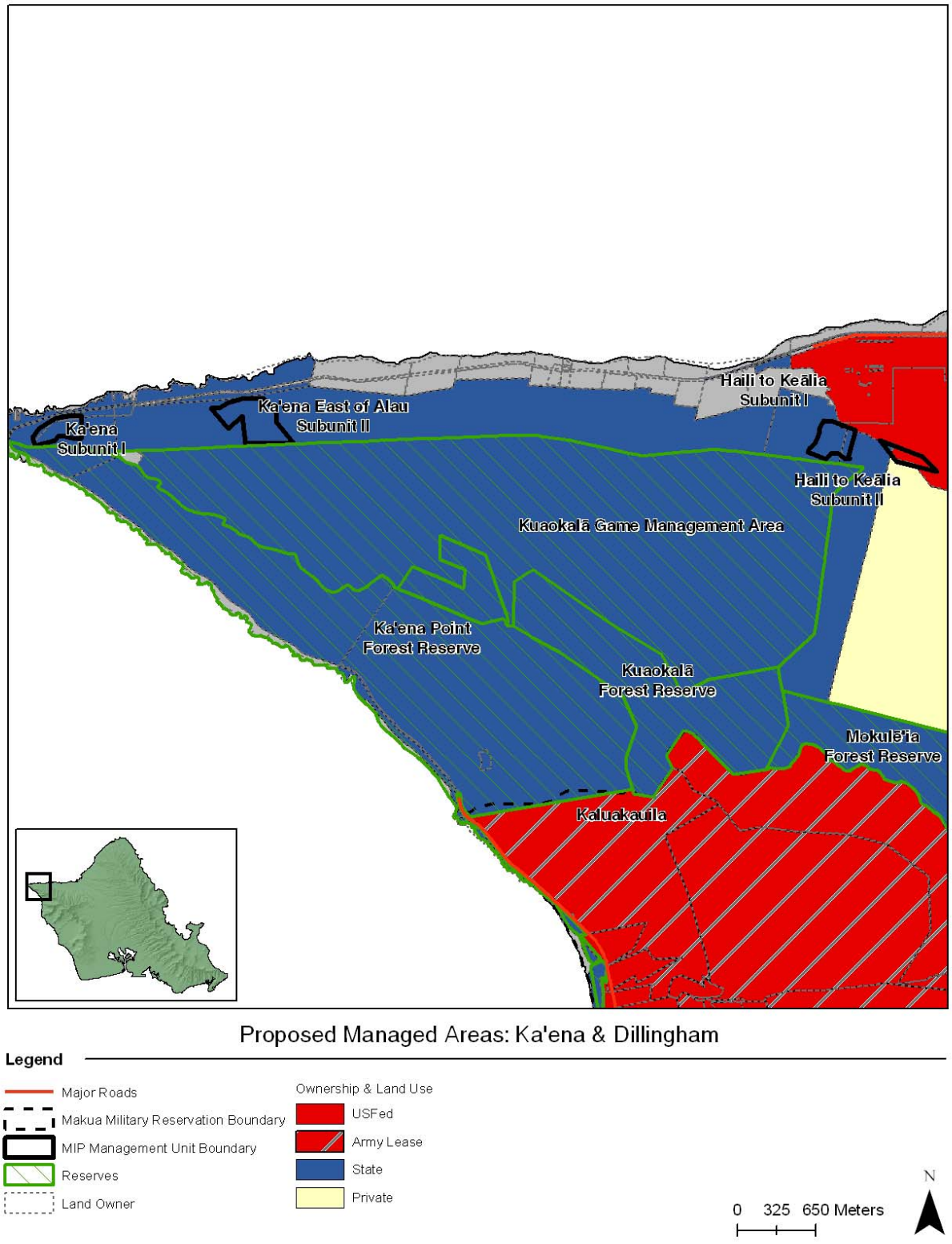
Haili to Keālia (I & II)- The proposed Haili to Keālia MUs are along the north coast of the Wai‘anae Mountains on Dillingham Military Reservation and State land (see Maps 9 & 10). Sububunits I and II would encompass 20 and 9.6 acres of mixed alien and native dry shrubland, respectively. Figures 15 and 16 show the habitat and terrain characteristic of this MU. This MU was designed to protect individuals and habitat for the rare plant Ma‘o hau hele (*Hibiscus brackenridgei* subsp. *Mokuleianus*). Proposed management actions for this MU include alien plant control and genetic collection of rare plant material for long-term storage and propagation.


**Figure 15.** View of the airfield from the Haili to Keālia MU subunit II. Some Wiliwili (*Erythrina sandwichensis*) trees are visible in the foreground as well as some Koa haole (*Leucaena leucocephala)* dominated habitat.

**Figure 16.** This photo is taken from the rocky cliffs within the Haili to Keālia MU subunit II and shows some Dillingham Military Reservation access roads below.




**Map 9. The proposed Kaʻena and Haili to Keālia management units.**




**Map 10. Ownership, land use, and forest reserve boundaries for the Ka‘ena and Haili to Keālia MUs.**

East Makaleha The East Makaleha Management Unit is located in the Upper Mokulēʻia Forest Reserve and can be accessed via the Mt. Kaʻala Road (see Maps 11 & 12). This fenced MU would enclose approximately 231 acres of native wet and mesic forest. The exclosure here would extend down slope to the north from the summit for over a kilometer (Figure 17). The rare species found within this MU are listed in Table 6.

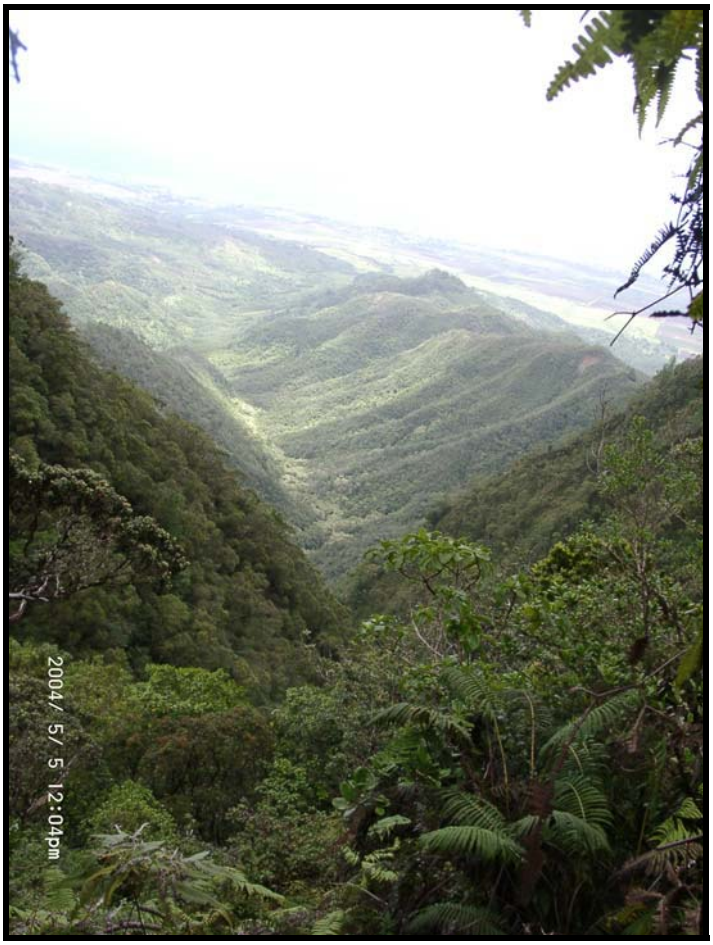



**Figure 17.** View of the East Makaleha MU from the southern, high-elevation reaches of the MU. Photo shows the wet forest typical of the upper elevation portions of this MU. The lower elevation dry forest habitat can be seen in the distance.

Manuwai -The Manuwai MU would be 166 acres in area. It lies within the Kaʻala Natural Area reserve mid way along the ridgeline between the summit of Mt. Kaʻala and Puʻu Pane (which is approximately three kilometers to the east of Kaʻala), with the fence apex at the summit of Puʻu Kamaohanui (Map 11). This unit can be reached by either the steep foot trail from Mt. Kaʻala, by helicopter, or from ranch access road below. The portion of the MU just off the Kamaohanui ridgeline is very steep and contains several large cliffs. The lower reaches are characterized by more gradually sloped forests. The narrow ridge and its trail leading down to the east from the summit of Mt. Kaʻala is the north boundary of SBMR, as well as the division between the Districts of Waialua to the north and Wahiawa to the south. The proposed MU would protect mixed native mesic forest including six federally listed endangered species (see Table 6).

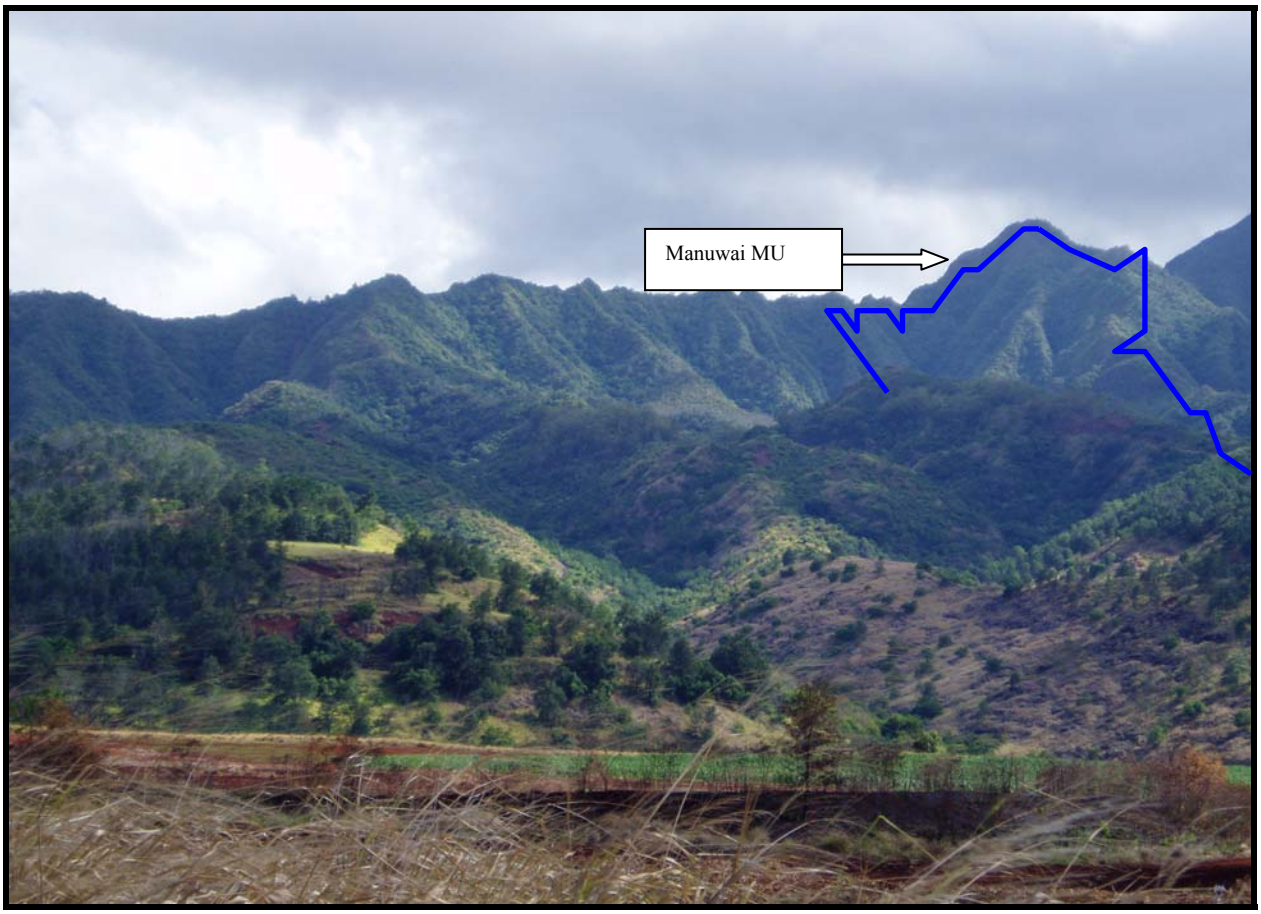
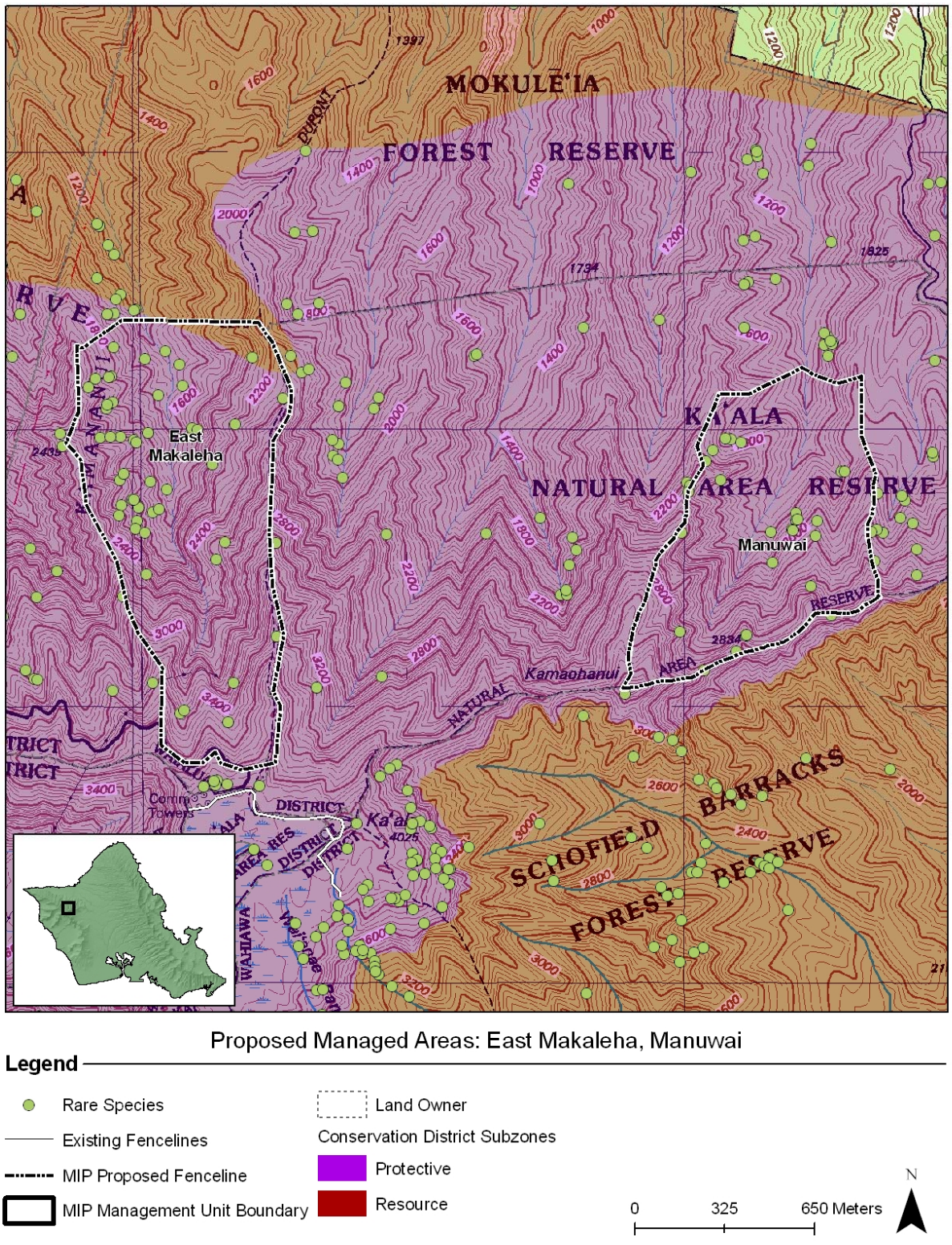
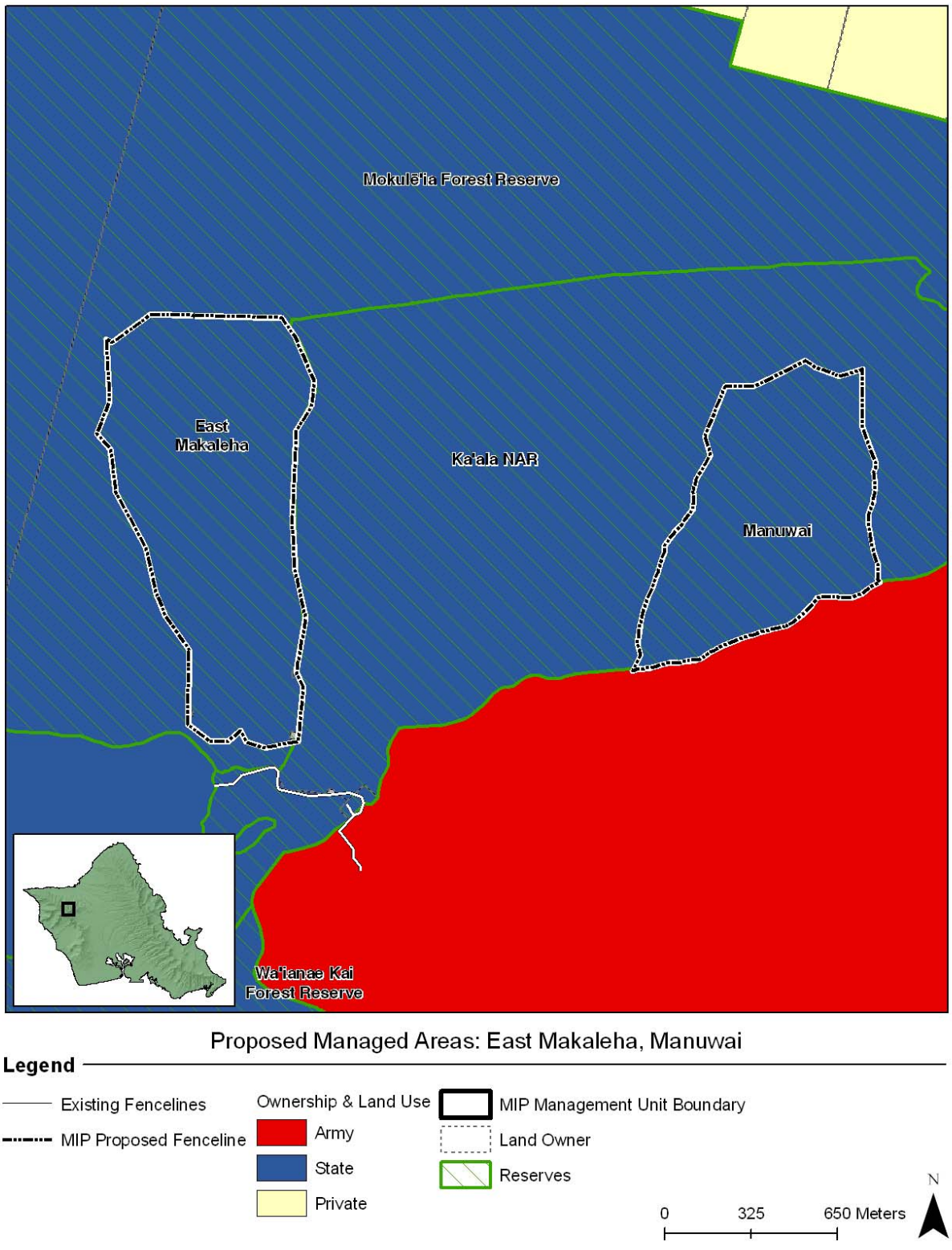



**Figure 18.** A view of Manuwai looking southwest from Kaukonahua road in Waialua. Note the burned agricultural lands in the foreground.




**Map 11. The proposed East Makaleha and Manuwai MUs on State land.**




**Map 12. Ownership, land use, and forest reserve boundaries for the proposed East Makaleha and Manuwai MUs.**

**Table 6. Rare species found in the proposed management units East Makaleha and Manuwai Management Units ***

| Scientific Name | Common Name | Federal Status[1] |
|---|---|---|
| **Plants** | | |
| *Abutilon sandwicensis* | | E |
| *Alsinidendron trinerve* | | E |
| *Caesalpinia kavaiensis* | Uhiuhi | E |
| *Colubrina oppositifolia* | Kauila | E |
| *Cyanea acuminata* | Hāhā, Ohawai | E |
| *Flueggea neowawraea* | Mehamehame | E |
| *Hedyotis degeneri* var. *degeneri* | | E |
| *Hedyotis parvula* | | E |
| *Lipochaeta tenuifolia* | Nehe | E |
| *Labordia cyrtandrae* | KaMākaha la | E |
| *Phyllostegia kaalaensis* | | E |
| *Pritchardia kaalae* | Loulu | E |
| **Animals** | | |
| *Achatinella mustelina* | Pupu Kuahiwi, Pupu Kani‘oe, Kahuli, O‘ahu Tree Snail | E |

*Source: Implementation Plan, Mākua Military Reservation, Island of O‘ahu. 2003.
[1]Key to Federal Status: E = endangered; C = candidate for listing; SOC = species of concern

Wai‘anae Kai- The Wai‘anae Kai MU consists of a single fenced enclosure in the Wai‘anae Kai Forest Reserve (see Maps 13 & 14). All that is needed to protect the MU from ungulates is strategic fencing at the mouth of a small valley. The MU lies to the south of the summit of Pu‘u Kawiwi along the Kamaile‘unu ridge that divides Wai‘anae Kai Valley from Mākaha Valley (Figure 19). This MU would enclose approximately nine acres of mixed alien and native dry to mesic forest which includes three federally listed endangered plant species, *Neraudia angulata* (Ma‘aloa, Ma‘oloa, ‘Oloa), *Nototrichium humile* (Kulu‘ī), and *Tetramalopium filiforme*.

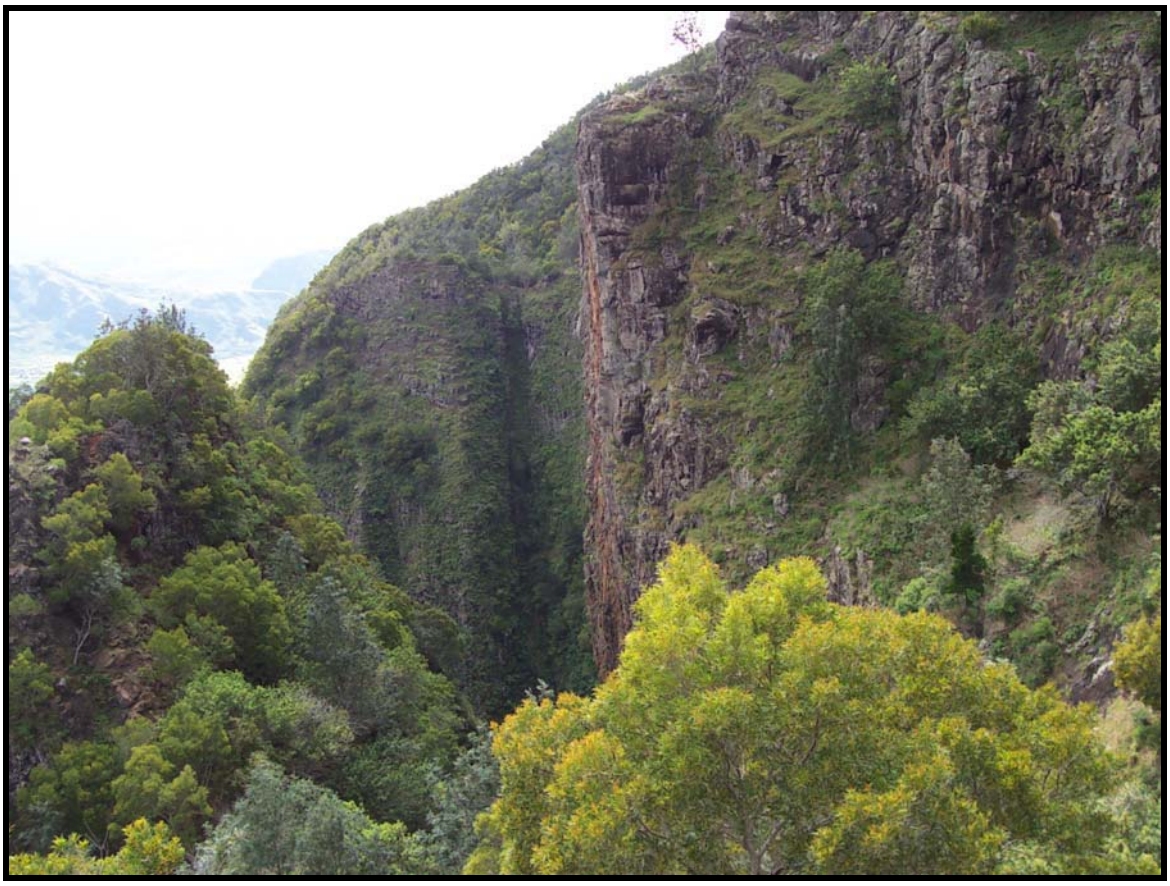
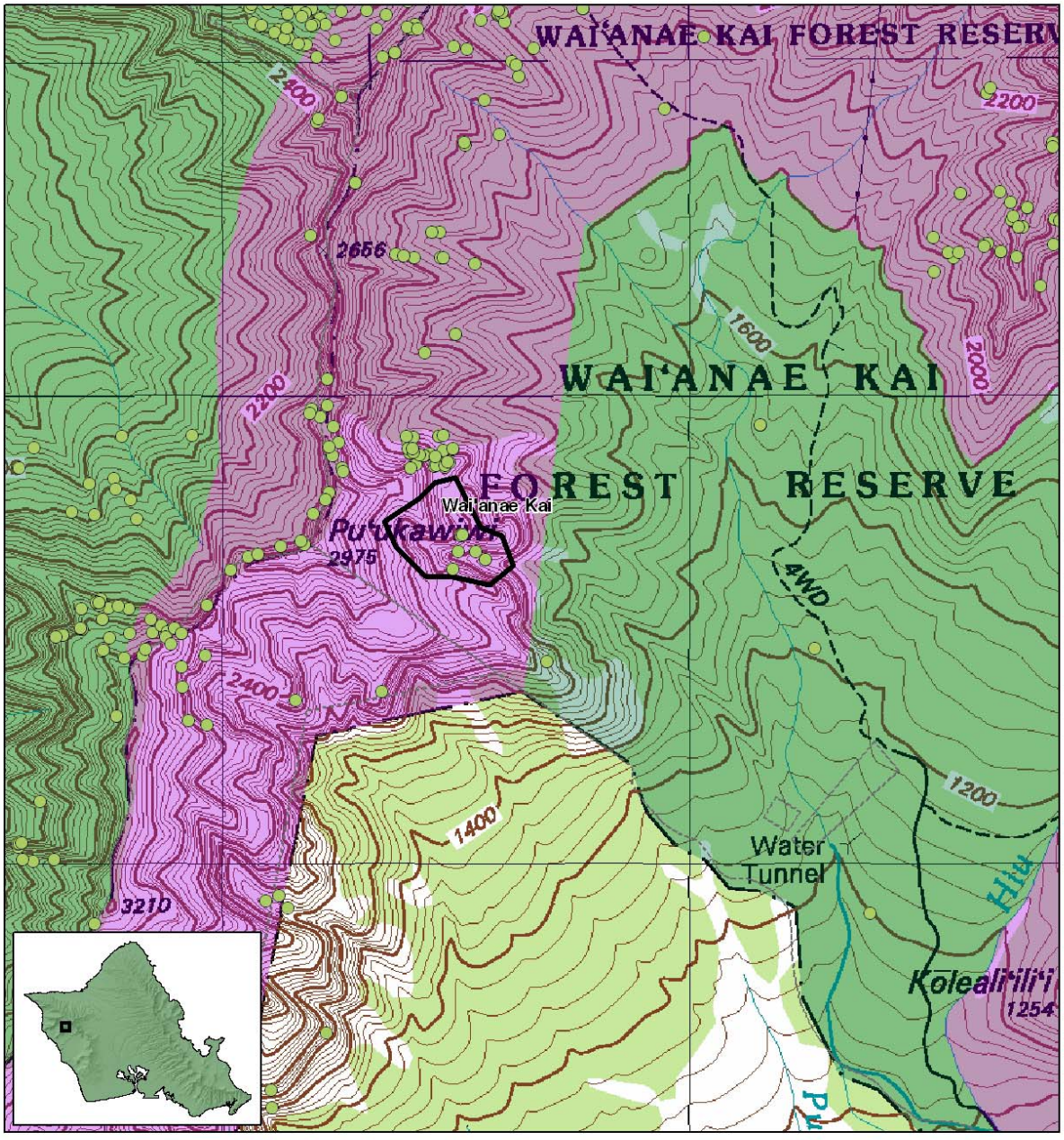
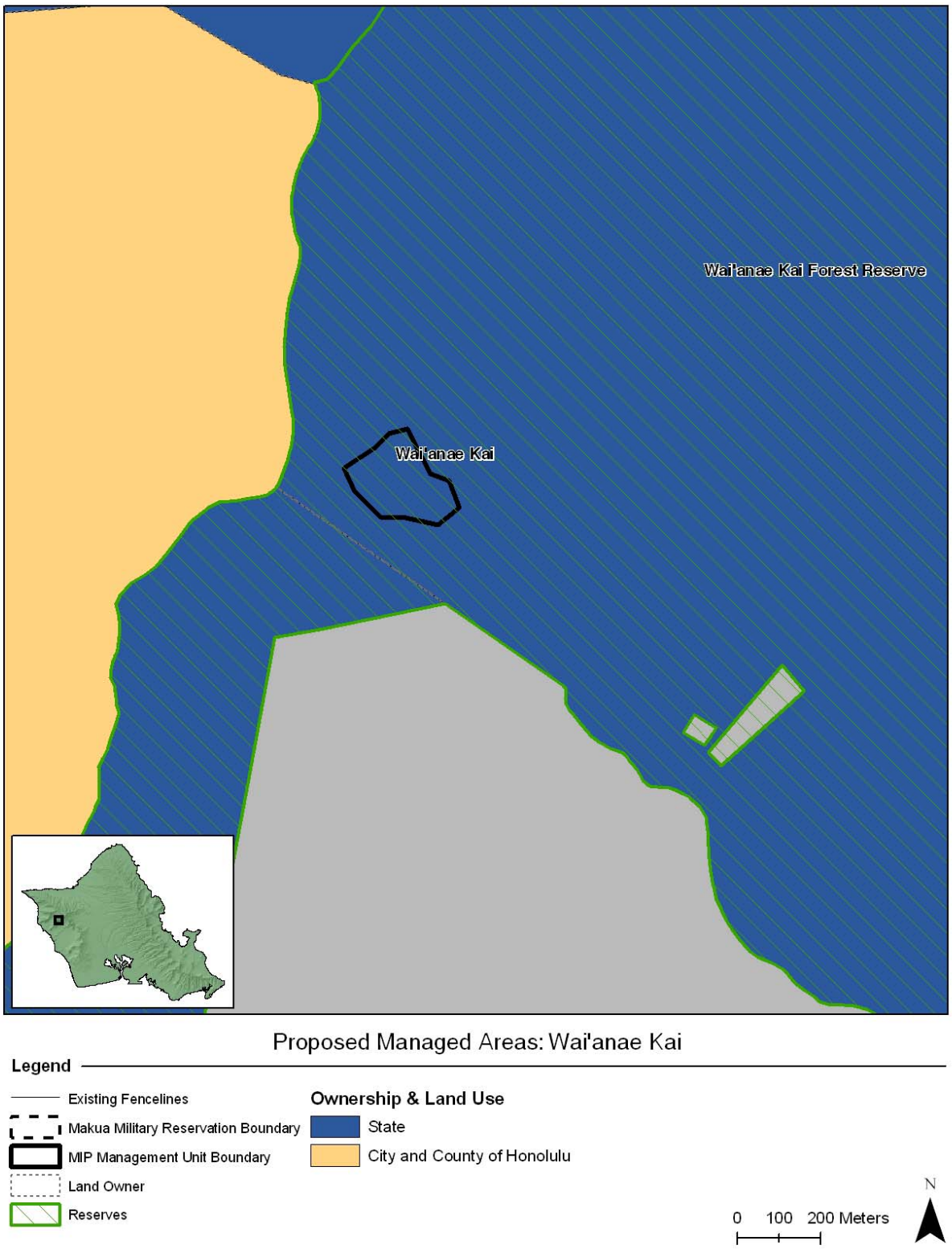


**Figure 19.** This Waiʻanae Kai MU is centered around the gulch in the center of the photo. Strategic fencing will need to be employed in order to protect this site from goats.




**Map 13. The proposed Wai‘anae Kai MU on State land.**




**Map 14. Ownership, land use, and forest reserve boundaries for the Wai‘anae Kai MU area.**

### 3.2.4 Management Units on The Nature Conservancy's Honouliuli Preserve

Kalua'ā and Wai'eli The 3,582-acre Honouliuli preserve is situated between 366 and 945 m (1,200 and 3,100 ft) elevation on the eastern slope of the Wai'anae Mountain Range of O'ahu and extends along the ridgeline from Mauna Kapu in the south to Pu'u Hāpapa in the north, and down slope out toward the east (The Nature Conservancy (TNC) 2000) (see Maps 15 & 16 and Figure 20). The uplands of Honouliuli are owned by the Estate of James Campbell, and have been managed as a Natural Area Preserve by the Nature Conservancy since 1990 through a long-term lease agreement. At the North of Honouliuli preserve the Kalua'ā and Wai'eli MU group consists of the existing Kalua'ā fenceline, encompassing approximately 97 acres, and the three additional Wai'eli fencelines, totaling approximately 28 acres. The rare species found within this MU and the other MUs on TNC managed land are listed in Table 7.


**Figure 20.** The majority of the forest shown is protected within the existing Kalua'ā subunit I fence.

'Ēkahanui- In the central portion of Honouliuli preserve the 'Ēkahanui MU consists of the existing subunit I which encompasses 45 acres and the proposed subunit II fenceline that would enclose approximately 157 acres of mixed native and alien mesic forest (see Maps 15 & 16 and Figure 21). The rare species found within this and the other MUs on TNC managed land are listed in Table 7. The lower portion of this MU was threatened by fire in September 2005, though the fire was suppressed before it burned very far into TNCs Honouliuli Preserve.

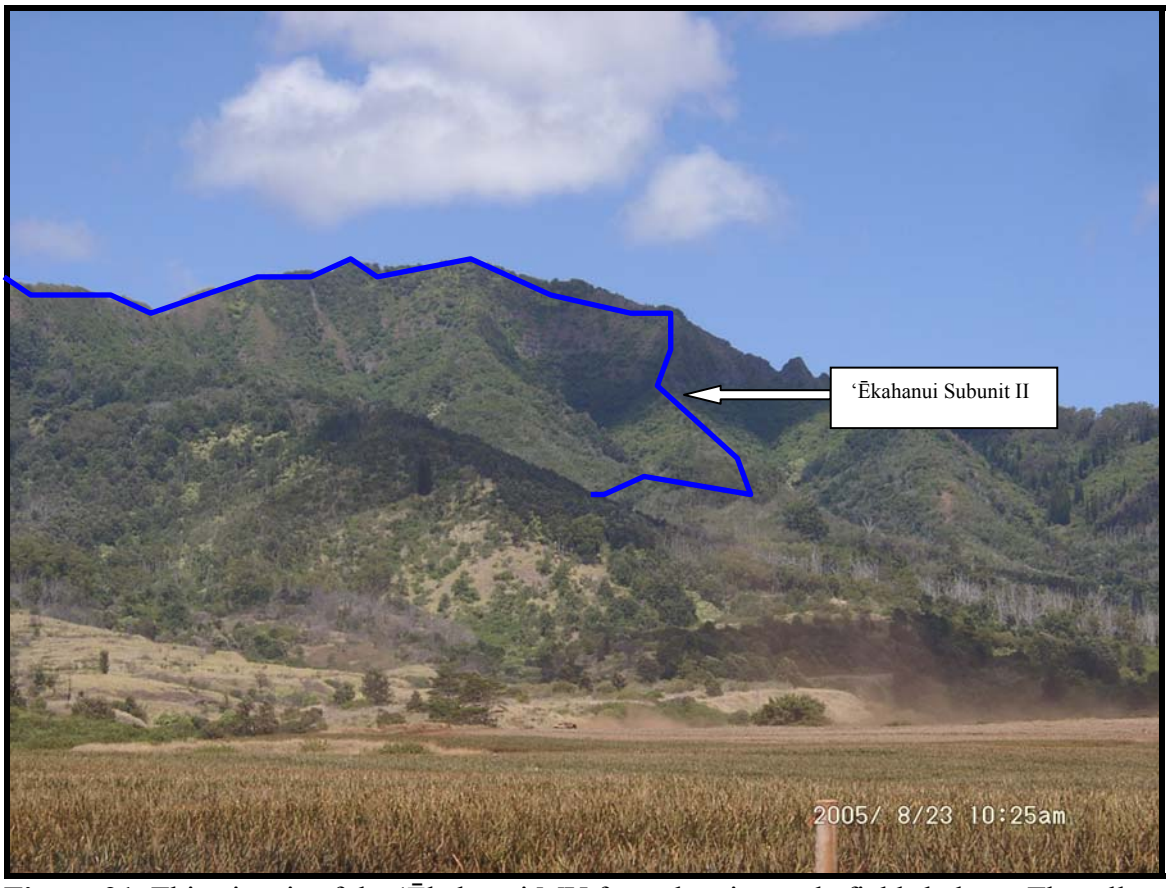
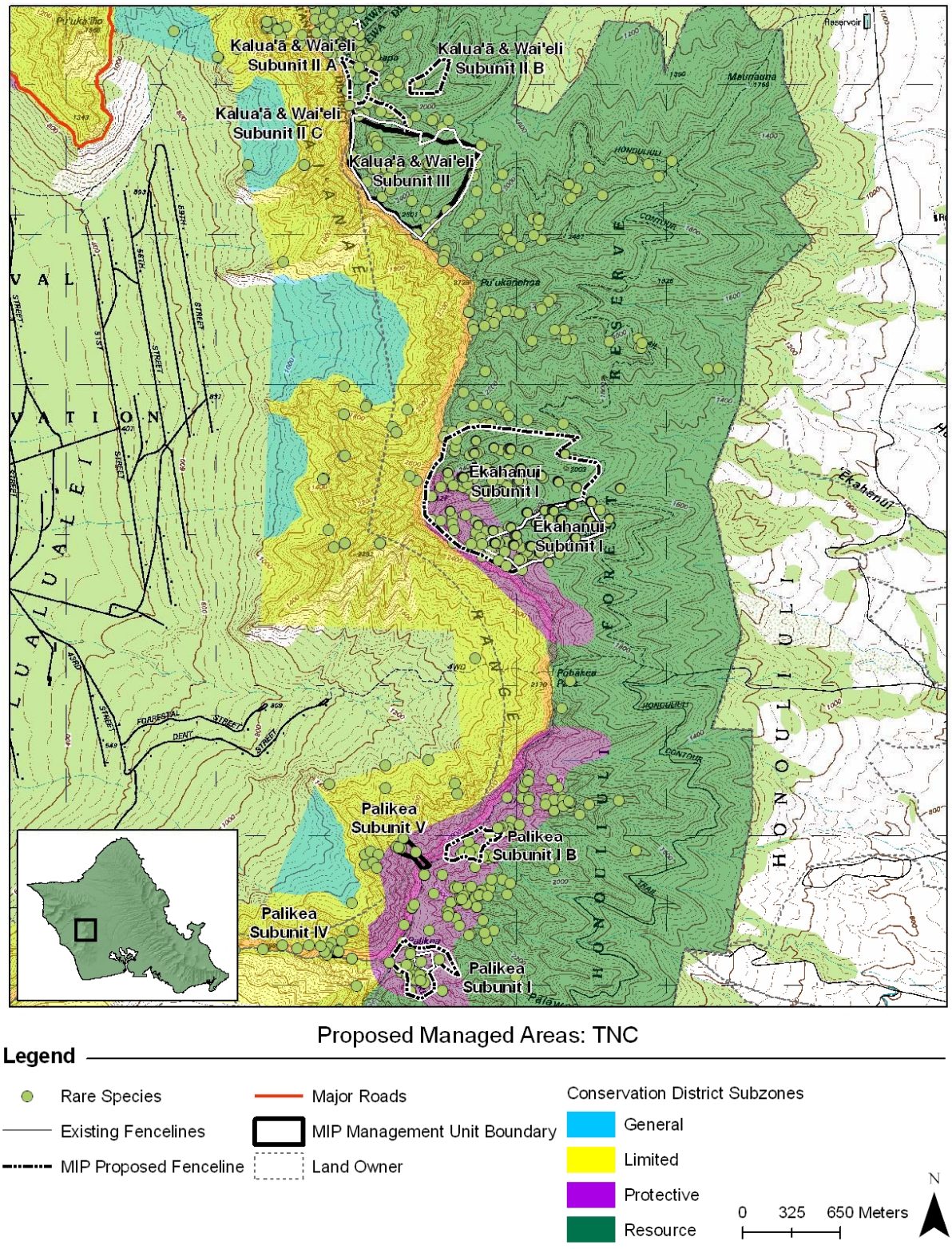



**Figure 21.** This view is of the ‘Ēkahanui MU from the pineapple fields below. The tallest peak in the photo is Pu‘u Kaua. Only the ‘Ēkahanui Subunit II is visible. Subunit I is hidden behind a ridge.

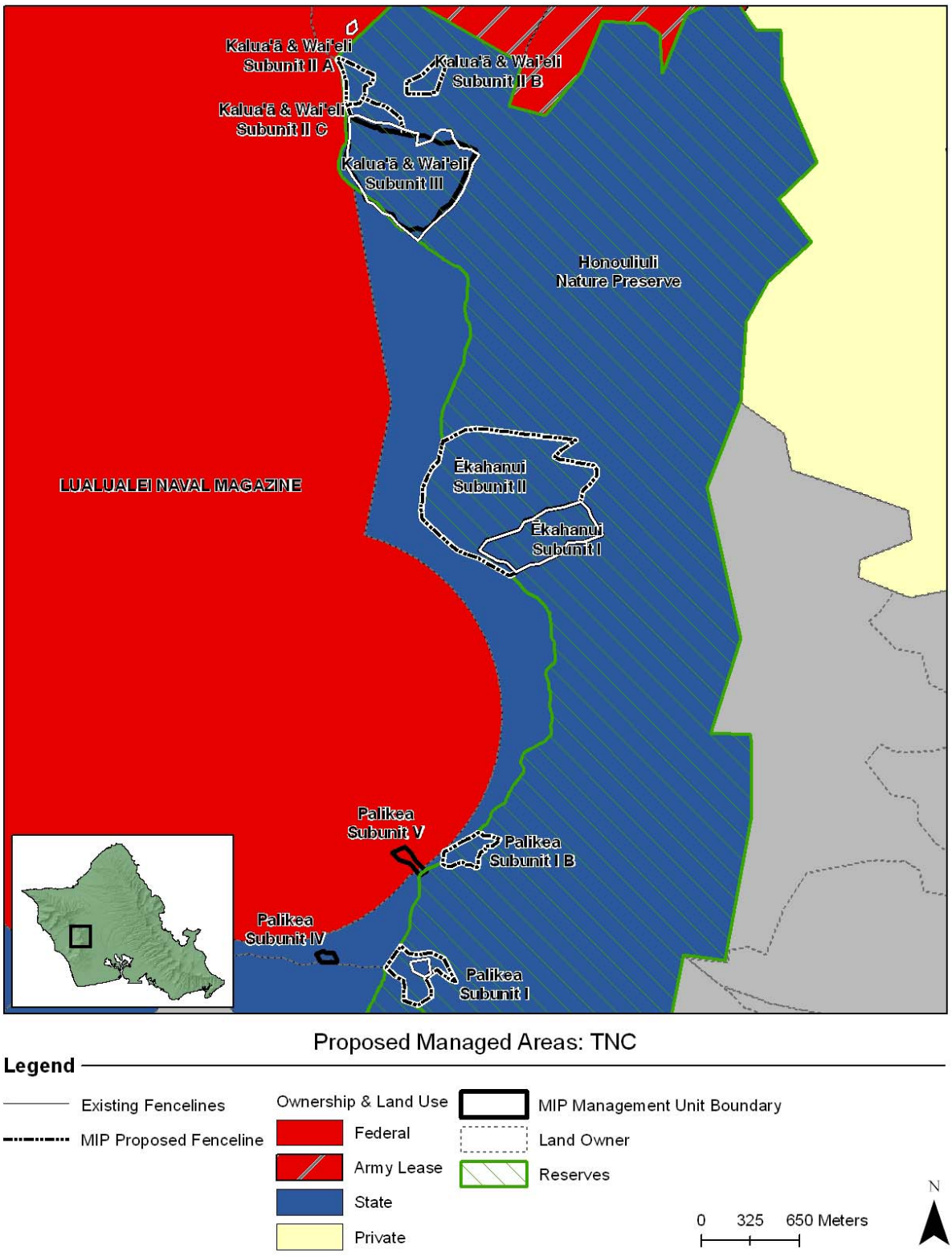
Palikea- At the south end of Honouliuli preserve, the Palikea MU group consists of four managed areas, two of which are proposed to be fenced (see Maps 15 & 16 and Figures 22 and 23). The Palikea subunits IA and IB are on the windward side of the Wai‘anae Range. Both are proposed to be fenced, subunit IA would be 21 acres and subunit IB would be approximately 11 acres. On the leeward side of the Wai‘anae Range subunits IV and V are proposed management units but would not be fenced due to steep terrain in those areas. These two unfenced management units total approximately 5 acres. Management actions proposed for this MU are ungulate fencing, alien plant control, potential alien invertebrate exclosures, small mammal control, genetic collections of both rare plants and snails for long-term storage and propagation, and reintroductions/augmentations of rare plants.

**Figure 22.** A view of the Palikea MU subunits occurring along the ridgeline as seen from the pineapple fields below.

**Figure 23.** This is a view from the Palikea MU, Subunit IV. In the foreground the dominant canopy tree ʻŌhiʻa (*Metrosideros polymorpha*) is visible.




**Map 15. The proposed Kalua‘ā, ʻĒkahanui, and Palikea management units within The Nature Conservancy’s Honouliuli Preserve, in the Wai‘anae Mountains of O‘ahu.**




**Map 16. Ownership and land use boundaries of the proposed management units on The Nature Conservancy's Honouliuli Preserve.**

**Table 7. Rare species found in the proposed management units Kalua‘ā and Wai‘eli, ‘Ēkahanui, and Palikea within The Nature Conservancy’s Honouliuli Preserve.***

| Scientific Name | Common Name | Federal Status[1] |
|---|---|---|
| **Plants** | | |
| *Abutilon sandwicense* | | E |
| *Alectryon macrococcus var. macrococcus* | Mahoe | E |
| *Bobea sandwicensis* | ‘Ahakea | SOC |
| *Cenchrus agrimonioides var. agrimonioides* | Kāmanomano | E |
| *Cyanea calycina* | Hāhā | C |
| *Cyanea grimesiana* subsp. *obatae* | Hāhā | E |
| *Cyanea membranacea* | Hāhā | SOC |
| *Cyanea pinnatifida* | Hāhā | E |
| *Delissea subcordata* | Hāhā | E |
| *Diellia falcata* | | E |
| *Diellia unisora* | | E |
| *Dissochondrus biflorus* | | SOC |
| *Exocarpos gaudichaudii* | Hulumoa, Heau | SOC |
| *Flueggea neowawraea* | Mehamehame | E |
| *Gardenia brighamii* | Nānū, Nā‘ū | E |
| *Gardenia mannii* | Nānū, Nā‘ū | E |
| *Hedyotis parvula* | | E |
| *Hesperomannia arbuscula* | | E |
| *Joinvillea ascendens* subsp. *ascendens* | ‘Ohe | SOC |
| *Labordia kaalae* | KaMākaha la | SOC |
| *Lobelia yuccoides* | Panaunau | SOC |
| *Melicope christophersenii* | ‘Alani | C |
| *Melicope cinera* | ‘Alani | SOC |
| *Melicope sandwicensis* | ‘Alani | SOC |
| *Melicope st johnii* | ‘Alani | E |
| *Morinda trimera* | Noni kuahiwi | SOC |
| *Neraudia angulata* | Ma‘aloa | E |
| *Neraudia melastomifolia* | Ma‘aloa | SOC |
| *Nothocestrum latifolium* | ‘Aiea | SOC |
| *Nothocestrum longifolium* | ‘Aiea | SOC |
| *Phyllostegia hirsuta* | | E |
| *Phyllostegia parviflora* var. *lydgatei* | | E |
| *Phyllostegia kaalaensis* | | E |
| *Phyllostegia mollis* | | E |
| *Plantago princeps var. princeps* | Ale, Laukahi Kuahiwi | E |
| *Platydesma cornuta var. decurrens* | Pilo kea | C |
| *Pleomele forbesii* | Halapepe | C |
| *Pteralyxia macrocarpa* | Kaulu | SOC |
| *Schiedea hookeri* | | E |
| *Schiedea kaalae* | | E |
| *Schiedea ligustrina* | | SOC |
| *Schiedea pentandra* | | SOC |
| *Sicyos lanceoloideus* | ‘Anunu | SOC |

| Scientific Name | Common Name | Federal Status[1] |
|---|---|---|
| *Silene perlmanii* | | E |
| *Solanum sandwicense* | Popolo ʻaiakeakua | E |
| *Stenogyne kanehoana* | | E |
| *Stronglyodon ruber* | Nuku iʻiwi | SOC |
| *Tetramolopium lepidotum* subsp. *lepidotum* | Laliʻi | E |
| *Urera kaalae* | Opuhe | E |
| *Lipochaeta tenuifolia* | Nehe | SOC |
| *Zanthoxylum dipetalum* var. *dipetalum* | Aʻe | SOC |
| **Animals** | | |
| **Snails** | | |
| *Achatinella concavospira* | Pupu kuahiwi, Pupu kaniʻoe, kahuli, Hawaiian tree snail | E |
| *Achatinella mustelina* | Pupu kuahiwi, Pupu kaniʻoe, kahuli, Hawaiian tree snail | E |
| **Birds** | | |
| *Chasiempis sandwichensis* subsp. *ibidis* | Oʻahu ʻElepaio | E |

*Source: Draft Environmental Assessment, Native Forest and Endangered Species Protection at Honouliuli Preserve, Oʻahu Hawaiʻi. Proposed by the Nature Conservancy of Hawaiʻi, 2005.
[1]Key to Federal Status: E = endangered; C = candidate for listing; SOC = species of concern

### 3.2.5 Management Unit proposed on Kamehameha Schools Land

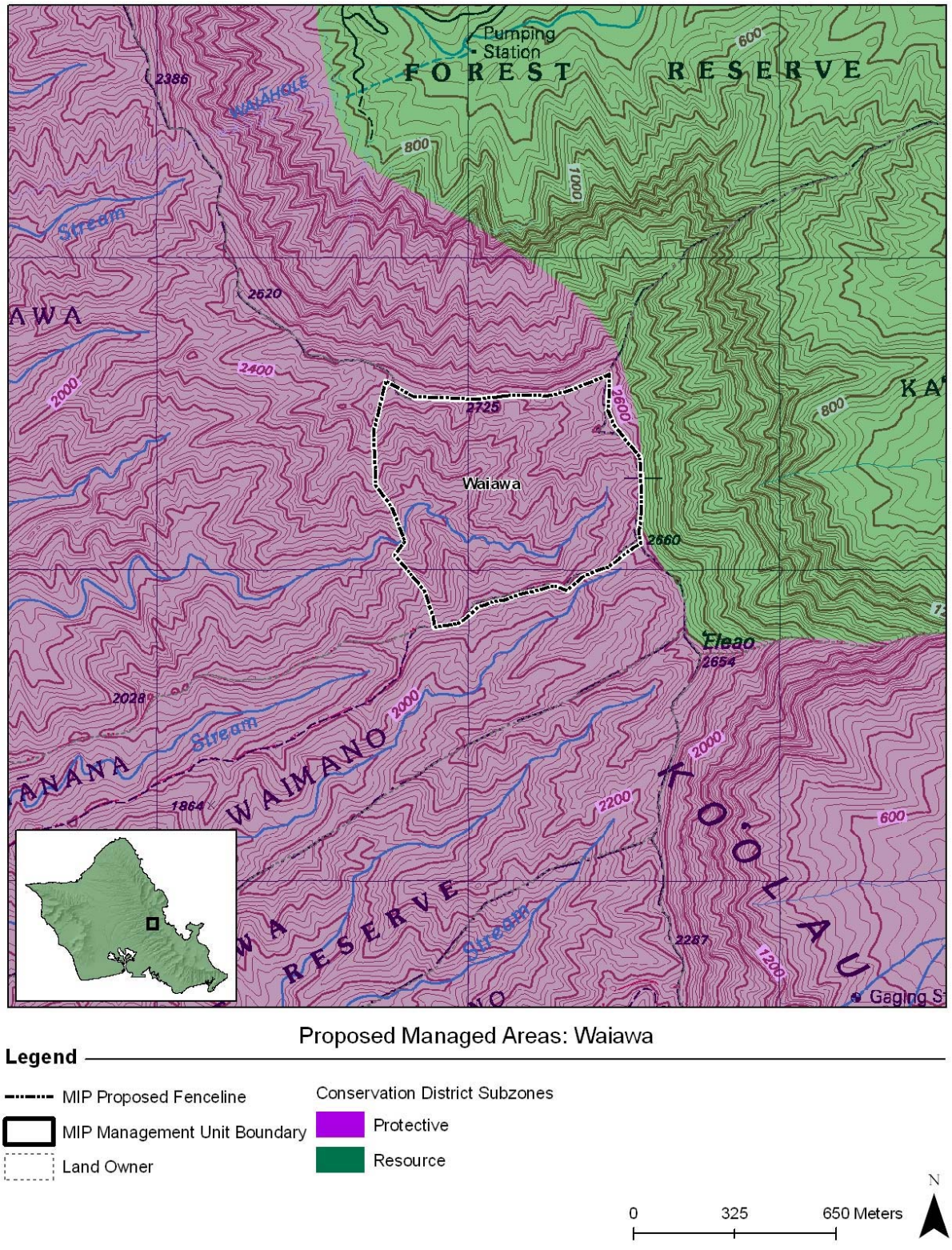
Waiawa The proposed managed area, in the back of Waiawa Valley, covers approximately 124 acres of native wet forest and is proposed to be fenced (see Maps 17 & 18 and Figure 24). This area is accessible near the upper end of Mānana hiking trail or via helicopter. The valley is owned by Kamehameha Schools (KS) and the Army plans to work cooperatively with KS land managers to construct the ungulate fence and manage this MU. Proposed management actions include construction of ungulate fence, alien plant control, small mammal control, genetic collection of rare plant species, and reintroductions/augmentations. Rare species found within this MU are listed in Table 8.

**Figure 24**. View of Waiawa MU as seen from Manana Trail looking northeast.

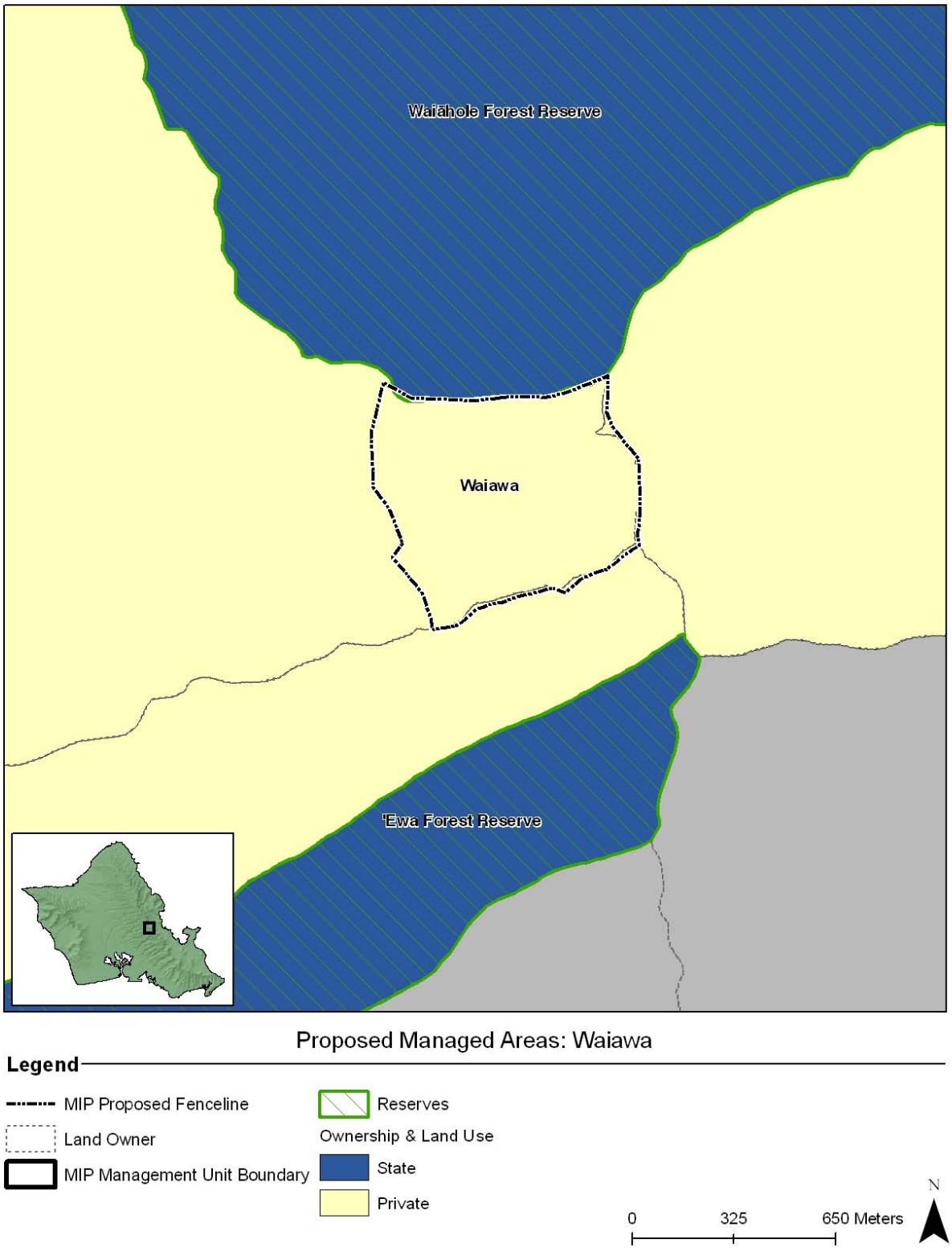
**Table 8. Rare species found in the Waiawa proposed MU on Kamehameha Schools Land.***

| Scientific Name | Common Name | Federal Status[1] |
|---|---|---|
| **Plants** | | |
| *Chamaesyce rockii* | ʻAkoko | E |
| *Cyanea calycina* | Hāhā | C |
| *Cyanea humboldtiana* | Hāhā | E |
| *Cyanea st.-johnii* | Hāhā | E |
| *Lobelia gaudichaudii* subsp. *koolauensis* | | E |
| *Lobelia oahuensis* | | E |
| *Plantago princeps* var. *princeps* | Ale | E |
| *Tetraplasandra gymnocarpa* | ʻOhe ʻohe | E |
| **Animals** | | |
| None known | | |

*Source: Implementation Plan, Mākua Military Reservation, Island of Oʻahu. 2003.
[1]Key to Federal Status: E = endangered; C = candidate for listing; SOC = species of concern




**Map 17. The proposed Waiawa MU on Kamehameha Schools Land in the Koʻolau Mountains of Oʻahu.**




**Map 18. Ownership and land use boundaries surrounding the proposed Waiawa MU.**

## 4. ALTERNATIVES CONSIDERED

4.1 No Action. Under the No Action Alternative, the US Army would not implement the Mākua Military Reservation Implementation Plan. The listed species would continue to decline in numbers due to the many threats they face, which could ultimately lead to their extinction.

4.2 Alternatives Considered but Not Carried Forward

4.2.1 Partial Action Alternative. Under this alternative, the Army would only conduct stabilization actions on Army lands. This alternative was not considered viable because there are not enough populations of each taxon on Army lands to reach the stabilization goals.

4.2.2 Outer Island Alternative. Under this alternative the Army would conduct natural resource management activities on other islands. This alternative was not considered viable and was dismissed from further evaluation because it is essential that the Army manage Oʻahu stock of the taxa it is affecting through training. As specified in the Endangered Species Act, the Army is responsible for minimizing the effects to the natural resources directly and indirectly affected by training activities. This does not include outer island stock, and most of the species do not occur on islands other than Oʻahu.

## 5. AFFECTED ENVIRONMENT

5.1 Kawailoa Training Area- Lower Peʻahināiʻa MU

5.1.1 Topography and Soils The Lower Peʻahināiʻa MU proposed for KLOA ranges in elevation from 2,100 ft to 2,500 ft. The area consists of a complex gulch and ridge system with moderate and steep-sided gulches in the north-central Koʻolau Mountains. A thin and fine textured soil mantle of 1 to 10 inches over saprolite is common to the area. The area proposed for management is classified as rough mountainous land.

5.1.2 Surface Water Resources The ʻŌpaeʻula stream, which flows roughly from east to west, is found just north of the proposed managed area. No surface streams are found within the proposed managed area, although the MU is adjacent to the ʻŌpaeʻula and Peahināiʻa streams.

5.1.3 Climatology and Air Quality The average temperature at KLOA averages between 70ºF and 80ºF. The average rainfall in the proposed managed area ranges from 197 to 236 inches annually (Giambelluca et al. 1986).

5.1.4 Noise Environment There is no information available on noise at KLOA (25th Infantry Division Light (L) and U.S. Army, Hawaiʻi 2001b). However, it is expected that some level of noise can be attributed to training activities within KLOA. These sources of noise include military vehicles, helicopters, and some non-live fire training.

5.1.5 Vegetation The area proposed for management is characterized as a lowland forest. The area is dominated by two natural communities, ʻŌhiʻa Forest and Uluhe Shrubland. Dominant species include *Metrosideros polymorpha, Hedyotis terminalis, Antidesma platyphyllum,*

*Myrsine lessertiana,* and *Syzygium sandwicensis.* Common ferns include Hāpuʻu (*Cibotium* spp.), *Dicranopteris linearis*, and *Diplopterygium pinnatum.* Common understory species include *Scaevola* spp. and *Dubautia* spp.

5.1.6 Threatened and Endangered Species There are five endangered species found in the area proposed for management (see Table 2).

5.1.7 Historic and Archaeological Resources At present KLOA has 79 known or recorded archaeological sites and/or cultural resources that have been identified in those few sections of the twenty three thousand acres that have been surveyed. These sites include prehistoric and contact period multi-feature agricultural sites, at least one habitation complex, an enclosure, a number of old trail segments, as well as historic era bridges, stream crossings, water management structures and military features (Zulick and Cox 2000). The majority of these previously identified cultural resources are located in the gulch bottoms, on the limited flats that occur along stream banks, and are concentrated primarily along the western edges of KLOA.

The Range, Training and Land Management Program Development Plan (RTLP, USACE and Nakata Planning Group 2000) states that all sites at KLOA would be considered significant under Criterion D of the 36 CFR 60.4 (National Register of Historic Places), as resources of prehistoric or historic importance. They add that any burial areas would be considered significant because of their importance to native Hawaiians.

To date inventory surveys for cultural resources have been completed on less than 10% of the KLOA. Stream banks and valley bottom flats are locations with the highest probability of containing as yet unidentified archeological sites, while all other areas in KLOA are considered to have a moderate probability for finds. A review of archaeological records on file with the State of Hawaiʻi Historic Preservation Office (SHPO) show that there have been no investigations, nor are there any known sites, at or near the proposed management area. The proposed 17 acre management area, its fence corridor and the general surroundings would all be investigated and inspected for the presence or absence of cultural resources during an inventory survey for cultural and archaeological resources. This field assessment would be coordinated with and undertaken in conjunction with planned activities of the Army's Natural Resources Section of DPW's Environmental Division within 2006.

5.1.8 Land Use Kawailoa Training Area (KLOA) is the largest of the Army's seven training areas on Oʻahu. This upland area covers 23,348 acres on the northern third of the western slopes of the Koʻolau Mountain Range. KLOA is located directly south of the Army's Kahuku Training Area (KTA) and north of East Range, Schofield Barracks (SBER). The majority of KLOA is characterized by very deep serpentine ravines, dense vegetation, and tropical rainforest, and contains some of the most rugged terrain on Oʻahu. The proposed managed area encompasses 17 acres in the south-central section of KLOA. Most of the twenty three thousand plus acres in the area, as well as the proposed smaller managed area are accessible only on foot or by helicopter. Presently the Army utilizes KLOA for Flight Training and maintains an easement along the west edge of KLOA called Drum Road for access between KTA and Helemano Military Reservation. Nap of the Earth helicopter training occasionally takes place over the proposed managed area, but any training on the ground is generally conducted at lower

elevation in sections well to the west, at least three kilometers from the proposed managed area. This general area is only occasionally visited by hunters and less frequently by hikers.

5.1.9 Socioeconomic Environment. Military personnel and expenditures have a substantial impact on the economy of Hawai‘i. The Hawai‘i State Department of Business, Economic Development and Tourism, State of Hawai‘i Data Book 2001 reported that federal defense expenditures totaled $3.971 billion, of which $1.282 billion was attributed to the Army. Statewide, the Army employed 16,345 active duty military and 4,455 civilians.

The proposed MU is a natural ecosystem and falls within the Conservation District. The nearest community is Wahiawā Town/Whitmore Village, located approximately 3.69 miles from the proposed MU.

5.1.10 Environmental Justice and Protection of Children. Identifying and addressing disproportionately high and adverse human health or environmental effects on minorities, low income populations, and children in the United States is required by Executive Order. For the purpose of this analysis, minority populations are defined as African American, American Indian, Asian and Pacific Islanders, and Hispanics. Low-income populations are those persons at or below the poverty level.

The project area is located in Honolulu County, Hawai‘i, which census data shows had a total of 876,156 persons in the 2000 census. Of the 876,156 persons, Asians were the predominant race (46%). The minority populations for Honolulu County were as follows: African American (2.4%), American Indian (<1%), Asian (46%) and Pacific Islanders (8.9%), and Hispanics (0%). Approximately 11.9% of the population in Hawai‘i is considered low income based on the average percent of persons in poverty from 1997-1999 (25$^{th}$ ID (L) and USARHAW 2001b).

5.2. Mākua Military Reservation – Kaluakauila, Kahanahāiki, ‘Ōhikilolo, and Lower ‘Ōhikilolo MUs

5.2.1 Topography and Soils. The elevation of the valley floor ranges from 20 to 400 ft while the steep Wai‘anae Mountain ridgeline cliff tops bordering the area range from 2,100 to 2,900 ft high. The soil types found in the proposed managed areas include: Tropohumults-Dystrandepts association, rock outcrop and Alakai Mucky Peat in the north and northeast proposed managed area, and rock outcroppings, rock lands, and stony lands in southern proposed managed areas (U.S. Soil Conservation Service 1972). Erosion can be significant when slopes are steep because of the high shrink-swell potential of these soils.

5.2.2 Surface Water Resources. There are no perennial streams on MMR. The intermittent Kalena Stream with head waters in Ko‘iahi Gulch crosses through a portion of the proposed managed area on the south side of Mākua Valley. Intermitent streams in MMR fit the state definition of Class 2 Inland Freshwaters. The objective of Class 2 waters is to “protect their use for recreational purposes, the support and propagation of aquatic life, agricultural and industrial water supplies, shipping, and navigation (Hawai‘i Administrative Rules, Title 11; Chapter 54 HAR 11-54-9).”

5.2.3 Climatology and Air Quality. The mean annual temperature in Mākua Valley is 22.9°C (77.0°F). The average annual precipitation ranges from 31.5 inches in the western portion of the valley to over 60 inches in the eastern part of the valley (Giambelluca et al. 1986). According to Giambelluca et al. (1986), rainfall also varies dramatically by elevation and exposure in Mākua Valley.

There is no information specific to air quality at MMR available, except that point-source emissions from explosives, dust, and smoke are examples of historical non-point source pollution at MMR (USACE and Nakata Planning Group 2000).

5.2.4 Noise Environment. Noise at MMR associated with artillery from firing ranges produced noise levels in Zone II and Zone III (up to 70 dBA) (United States Army Environmental Hygiene Agency (USAEHA, 1988). Noise contour maps are available in the Environmental Impact Statement for Military Training at Mākua Military Reservation (US Army 2005) and show that Zone III levels produced by training activities within the Valley would extend approximately one mile over the water in Mākua Beach.

5.2.5 Vegetation. Vegetation in Kaluakauila and Kahanahāiki proposed MUs include Lowland Mesic and Dry Forest and Shrubland, while vegetation in the ʻŌhikilolo and Lower ʻŌhikilolo proposed MUs include Dry Cliffs and Lowland Dry Shrubland and Grassland as well as Lowland Mesic Forest. Dominant species in the Lowland Mesic Forest around the Mākua Valley rim include ʻŌhiʻa (*Metrosideros polymorpha*) and Lama (*Diospyros hillebrandii*) (Gagne and Cuddihy 1999). Dominant species in the Lowland Mesic Shrubland include *Metrosideros polymorpha, M. tremuloides, Myrsine lessertiana*, *Psychotria hathewayi*, *Bidens torta, Sphenomeris chinensis,* and *Dodonaea viscosa.* Dominant species in the Dry Cliffs and Lowland Dry Shrubland and Grassland include *Bidens spp., Chamaesyce celastroides, Dodonaea viscosa,* and *Heteropogon contortus* (Gagne and Cuddihy 1999).

5.2.6 Threatened and Endangered Species. There are 32 threatened and endangered species in the areas proposed for management (Table 3).

5.2.7 Historic and Archaeological Resources. The present configuration of this military reservation actually encompasses two large traditional land divisions (or *ahupuaa)*. The southern or right half of the main valley (when viewed from the shore) is the *ahupuaa* of Mākua. The section to the left of the central stream, or the northern half of the main valley and the large block of mountains further to the northwest, make up the *ahupuaa* of Kahanahāiki. The number of known archaeological sites at MMR presently stands at 119. These identified sites include many multi-featured sites , which include examples of heiau, dry (*kula*) land agricultural terraces, shrines, habitation complexes, house platforms, enclosures, wells and springs (*puna*), trails to historic walls, ranch features and military features from the era between the World Wars (Antone and Exzabe, 2005; Cox and Zulick, 2002). The majority of these cultural resources are located on the valley floor and stream bottom areas rather than on the upper slopes or ridges. Cultural Resource Surveys at MMR have been undertaken for only about 30% of the total area to date, but are on going. As more detailed planning for the layout of the four management area fences is undertaken, the fence corridor and general surroundings of each will be investigated and inspected for the presence or absence of cultural resources during an Inventory Survey for

Cultural and Archaeological Resources. These field assessments will be coordinated with activities of the Army's Natural Resources Section of DPW's Environmental Division in the near future.

5.2.8 Land Use Mākua Military Reservation is the largest training area on Oʻahu that would support both maneuver and live-fire training. Live ammunition fire requires a surface danger zone and an associated impact area. The impact area and the temporary ammunition holding area (AHA) are restricted access areas due to the danger from unexploded ordnance. The impact area is 457 acres in Mākua Valley, and rises from the valley floor to 900 feet in elevation. The proposed managed areas in MMR are considered areas of risk from unexploded ordnance. No training takes places in the proposed managed areas. Access is restricted to Army personnel and contractors, some area require contractors be accompanied by unexploded ordnance experts. Current land use in the proposed managed areas is restricted to natural resources management activities. Interested Cultural Groups currently may be escorted into MMR in coordination with the Army's DPW Cultural or Natural Resources Programs.

5.2.9 Socioeconomic Environment. Military personnel and expenditures have a substantial impact on the economy of Hawaiʻi. The Hawaiʻi State Department of Business, Economic Development and Tourism, State of Hawaiʻi Data Book 2001 reported that federal defense expenditures totaled $3.971 billion, of which $1.282 billion was attributed to the Army. Statewide, the Army employed 16,345 active duty military and 4,455 civilians.

5.2.10 Environmental Justice and Protection of Children. See section 4.1.10.

## 5.3 Schofield Barracks Military Reservation (SBMR)- Puʻu Kūmakaliʻi MU

5.3.1 Topography and Soils The proposed MU lies along the southwestern border of SBMR West Range and straddles the main Waiʻanae Ridge crestline. It encompasses an area of steep to moderate slopes along the upper ridge crest from 2,400 to 2,880 ft in elevation. Soil types include Tropohumults-Dystrandepts association and rock land (U.S. Soil Conservation Service 1972).

5.3.2 Surface Water Resources There are no streams in the proposed MU. Water runoff from the area drains into Waikele Stream, which is classified by the state as a Class 2 stream (HAR 11-54-9). The Class 2 inland water designation objective is to have "protect their use for recreational purposes, the support of propagation of aquatic life, agricultural and industrial water supplies, shipping, and navigation" and "shall not act as receiving waters for any discharge which has not received the best degree of treatment or control…". To date, no stream bioassessments or water quality sampling have been conducted by the Army on SBMR. However, there are no expected contaminated run off issues from the Army's proposed conservation work in this MU.

5.3.3 Climatology and Air Quality The mean annual temperature in SBMR ranges from 20.6°C (69°F) in January and February to 25°C (77°F) in August (USACE and Nakata Planning Group 2000), and temperature generally increases 3°F per 1,000 foot increase in elevation. Average

rainfall in the proposed managed area ranges between 40 and 59 inches per year (Giambelluca et al. 1986). However, the average rainfall varies with elevation and exposure.

Although air quality at SBMR is generally considered good, emissions from transportation and explosives can be a major problem during troop and vehicular movements, and while using helicopters, simulators, pyrotechnics, and ammunition (USACE and Nakata Planning Group 2000).

5.3.4 Noise Environment Noise at SBMR, associated with artillery from firing ranges and aircraft at Wheeler AAF, produces noise levels in Zone II (65-75 dBC) that encroached >1,000 m into housing, schools, and other facilities and is not compatible with the Zone II noise environment (USAEHA 1988). Noise associated with the proposed MU would be negligible, as the area is remote and no heavy machinery is needed or anticipated in the proposed management actions.

5.3.5 Vegetation. Vegetation types in the proposed managed area include Dry Cliffs and Lowland Mesic Forest. Lowland Mesic Forest is characterized by *Metrosideros polymorpha*, *Hedyotis terminalis*, the sedge *Carex wahuensis*, the fern *Sphenomeris chinensis* and the shrubs *Bidens* sp., *Vaccinium* sp., and *Scaevola gaudichaudiana* (Gagne and Cuddihy 1999).

5.3.6 Threatened and Endangered Species. There are four rare and endangered species found in the area proposed for management. See section 2.2.1.

5.3.7 Historic and Archaeological Resources. Presently, Schofield Barracks Military Reservation (SBMR) has at least 76 identified archaeological sites or cultural resources (excluding the cantonment area - SBC). These sites are primarily on the lower elevation flat lands and nearby stream gulches and include two prehistoric heiau or Hawaiian temple, 30 multi-feature non- or semi-irrigated agricultural sites, 27 multi-feature irrigated agricultural sites, and five multi-feature habitation sites, trails and historic era features (USACE and Nakata Planning Group 2000; Zulick and Cox 2000). Surveys for cultural resources at SBMR are about 40% completed, with additional surveys being done at this time under contract. However, the proposed Pu‘u Kūmakali‘i MU occurs on the ridgecrest of the Wai‘anae Mountain Range.

The only site type that can generally be expected to be found on the higher ridge tops, like the proposed Pu‘u Kūmakali‘i MU, are remnants of old communication routes or trails. This proposed MU straddles the main Wai‘anae Summit Ridge and the existing summit ridge trail. Segments of this ridge trail or route traditionally served as the primary connection between the Kolekole Pass area and the summit of Ka‘ala. In turn these two crossing points served as the main direct overland connection for the population of the eight *ahupuaa* of the Wai‘anae *Moku* (District) on the leeward coast and that district’s upland *ahupuaa* of Wai‘anae Uka. The later *ahupuaa* traditionally had always been a subpart of the Wai‘anae District. Wai‘anae Uka is situated on the windward side of the ridge, at the high point of the saddle area of the central plains of O`ahu, and reaches across to the Ko‘olau Summit to the east. It thus provided the people of Wai‘anae access to the full range of those upland resources not otherwise available on the leeward side of the ridge. The Wai‘anae ridge trail(s) and Kolekole pass are mentioned in a number of traditional stories (e.g. Fornander, 1885 and Beckwith, 1940) and in articles in early Hawaiian language newspapers (e.g. John Papa I`i, re ‘Elou Cliff Road … coming down from

Kalena … to Wai‘anae’, in Kuokoa, Jan. 1870, also see Sterling and Summers (1978:134-5). Ross Cordy speculates on a possible route for I`i’s Elou as:

> “…may have entered Wai`anae valley down the steep Kamaile`una ridgeline off Ka`ala and joined Kūmaipō trail” (Cordy, 2002:74-5).

His proposed route would take that trail along the main ridge line to the north from Pu‘u Kalena, to Ka‘ala (about two and a half kilometers) across that summit and then down to the ridge separating upper Mākaha and Wai‘anae valleys, and thus away from the proposed MU. It is suggested here that another, more likely, possibility is that I`i’s Elou Trail route went south along the main ridge from Pu‘u Kalena, a much shorter distance, to meet the top of the spur ridge that then runs down to the west. This is along the narrow spine of the ridge that separates upper Wai‘anae and Lualualei valleys. This would provide the best direct link to Pōka‘i Bay and the population center of the *moku* (district, and sometimes independent kingdom) and the biggest village, Wai‘anae, on the whole leeward coast. This overland route would come to within half a kilometer of the proposed management area. There are a few sites noted in near by gulches to the east and those at Kolekole but all are at much lower elevations than that of the proposed MU and all are more than half a kilometer distant.

Although the establishment of this MU will not require any construction of fences or other structures or alterations, the general surroundings will all be investigated and inspected for the presence of cultural resources during an inventory survey for cultural and archaeological resources. This field assessment will be coordinated with and be undertaken in conjunction with planned activities of the Army’s Natural Resources Section of DPW’s Environmental Division in the near future.

5.3.8 Land Use. Lands used for maneuvers at SBMR include the cantonment area, maneuver training areas, ranges, and impact areas. The impact area, located in steep, more rugged terrain west of the cantonment, is the main site for fire ranges practices on O‘ahu (USACE and Nakata Planning Group 2000). Small arms, machine gun, mortar, grenade, antitank, and limited short-range indirect fire artillery training are conducted in these firing ranges. The live-fire facilities and ranges at SBMR are used year-round (R.M. Towill Corporation 1997). No training takes place in the proposed managed area. SBMR has numerous helipads and most of the installation is accessible by helicopter. Hunting is allowed on SBMR, although it is restricted to Army personnel and their civilian guests. Current land use in the proposed managed areas is restricted to natural resources management activities.

5.3.9 Socioeconomic Environment. Military personnel and expenditures have a substantial impact on the economy of Hawai‘i. The Hawai‘i State Department of Business, Economic Development and Tourism, State of Hawai‘i Data Book 2001 reported that federal defense expenditures totaled $3.971 billion, of which $1.282 billion was attributed to the Army. Statewide, the Army employed 16,345 active duty military and 4,455 civilians.

5.3.10 Environmental Justice and Protection of Children. See section 4.1.10

5.4 Mākaha , Kea‘au and Mākaha, and Kamaile‘unu MUs

5.4.1 Topography and Soils. Elevation in the Mākaha subunits I, II and III range from 800 to 3,270 ft; the Kamaile‘unu Ridge proposed management unit is at 3,270 ft; the Kea‘au/Mākaha Ridge proposed management unit is at 2,450 to 2,700 feet (MIP 2003). The terrain ranges from gradually sloped to steep grade forest and includes some cliff habitat and ridge top. Soil types found in the proposed management units include Tropohumults-Dystrandepts association, rock outcrop, and rock land. Erosion can be significant when slopes are steep because of the high shrink-swell potential of these soils (USSCS 1972).

5.4.2 Surface Water Resources. In upper Mākaha valley, the rain is channeled through intermittent streams in the proposed managed areas that flow into the Mākaha and Eku streams in the lower valley. The Mākaha stream generally flows year-round. These streams are considered by the state as Class 2 (HAR 11-54-9). There are no surface streams in the ridgetop proposed MUs.

5.4.3 Climatology and Air Quality. Average rainfall in the proposed managed areas ranges from 60 to 78 inches per year, with higher rainfall amounts at the higher elevation areas (Giambelluca et al. 1986). The average annual temperature ranges from 16°C to 29°C (60°F to 85°F) (Department of Geography 2000). There are no ambient air quality data for this area. The proposed managed areas occur in remote natural areas, and there are no man-made structures or emission sources. Therefore, it is believed that air quality here is generally good.

5.4.4 Noise Environment. There are no ambient noise level data for this area. The proposed managed areas are far removed from residential or agricultural land and no man-made structures exist nearby. Therefore, it is believed that noise conditions here are generally good.

5.4.5 Vegetation. Vegetation types in the proposed managed areas include Dry Cliffs and Lowland Mesic Forest. Lowland Mesic Forest is characterized by *Metrosideros polymorpha*, *Hedyotis terminalis*, the sedge *Carex wahuensis*, the fern *Sphenomeris chinensis* and the shrubs *Bidens* sp., *Vaccinium* sp., and *Scaevola gaudichaudiana* (Gagne and Cuddihy 1999). Other species commonly found in the proposed managed areas include koa (*Acacia koa*), lama (*Diospyros hillebrandii* and *D. sandwicensis*) and lonomea (*Sapindus oahuensis*).

5.4.6 Threatened and Endangered Species. There are 20 rare and endangered plant species and three rare and endangered animal species found in the area proposed for management (Table 4).

5.4.7 Historic and Archaeological Resources. Cultural use of Mākaha Valley in the past has been extensive and relatively well documented. Over 300 sites consisting of over 600 features have been identified. In addition to the dominant Kāne‘ākī Heiau (State Site 50-80-07-170), the lower and upper valley bottoms contain numerous site complex systems of irrigated (*loi*) and dry (*kula*) land agricultural terrace complexes, religious features, habitation platforms and terraces, and seasonal or recurrent field shelters, walls, mounds, and several historical sites.

Most of leeward O‘ahu was initially settled along the coast between AD 900-1000 (Cordy 2002). The population relied on the wealth of marine resources for subsistence and traveled into the

valleys on day trips or short duration trips to gather upland resources. As populations and subsistence demands (and methods) increased, settlements expanded inland to take advantage of the upland resources and more reliable water sources. Unlike the rest of leeward Oʻahu, primary settlement in Mākaha developed more inland near the back of the "lower valley" roughly 1.5 miles from the coast, just below Kāneʻākī Heiau, with smaller communities established along the coast. Excavation results from habitation sites in this mid valley settlement area date as early as AD 1120, which is contemporaneous to other early coastal settlements of leeward Oʻahu (Green 1970:99-100, Cordy 2002:11-21). Results for dates from an agricultural terrace complex in the upper valley are slightly later, AD 1280 at the earliest, implying early upper valley use may have been more focused on agriculture than habitation.

Cultural resources specialists from the DPW's Environmental Division conducted a limited reconnaissance survey along portions of the Makaha Subunit I fence line perimeter on April 20 and May 20, 2004 (See Map 7). The Cultural Resources Specialists searched for field shelters and agricultural sites similar and supplementary to the extensive field systems identified in the valley bottom as well as other natural and constructed features.

A remnant terrace and several low alignments (State Site 50-80-07-6690) of single course boulders were identified on the gradual slope of a wide ridge at the center of the lower section of the proposed fence line. The terrace may be a possible temporary habitation or field station terrace. The size alone suggests a more substantial usage than just dry land agriculture. The function of the boulder alignments is likely agricultural in origin, however may also be for controlling erosion. Additional cobbles and boulders appear to form discontinuous remnant alignments across the slope to the east and south/upslope of the terrace suggesting supplemental dry land agriculture that has been disturbed by erosion and animal activity.

The Subunit II exclosure is planned to connect to Subunit I and extend to the east approximately one kilometer along the crest of Kūmaipō or Kamaileʻunu ridge and down slope into the upper most section of Mākaha Valley. This ridge top is one of the traditional routes up to Kaʻala and over into the *ahupuaa* of Waiʻanae Uka, which was part of Waiʻanae District (as discussed in a previous section above). When the reconnaissance for the fence layout stage in this subunit is undertaken in this BWS area Cultural Resources Section crew would accompany the Natural Resources Staff to minimize and mitigate the possible impact of the fence construction. In addition the trail and general surroundings of each of the other smaller fences (Subunits III, Waiʻanae Kai and Keaʻau/Mākaha) would all be investigated and inspected for the presence of cultural resources during an Inventory Survey for Cultural and Archaeological Resources. These field assessments would be coordinated with and be undertaken in conjunction with planned helicopter access actions of the Army's Natural Resources Section of DPW's Environmental Division sometime in the near future.

5.4.8 Land Use. The areas proposed for management are within the Conservation District and are protected as a watershed by BWS. The area is currently closed to the public although hunters and hikers occasionally access the land. Additionally BWS coordinates site visits to Makaha with various cultural groups interested in educational purposes.

5.4.9 Socioeconomic Environment. The proposed managed area is a natural area within the Conservation District. The nearest community is the town of Mākaha, located roughly five miles from the proposed managed areas.

5.4.10 Environmental Justice and Protection of Children. See section 4.1.10.

5.5 State of Hawai‘i - Pahole, Upper Kapuna, West Makaleha, Ka‘ena, Haili to Keālia, East Makaleha, Manuwai, and Wai‘anae Kai MUs

5.5.1 Topography and Soils. The elevation of the proposed Pahole, Upper Kapuna, and West Makaleha MUs in the Pahole NAR and Mokulē‘ia Forest Reserve range from 463 m to 634 m (1,520 to 2,080 ft) (MIP 2003). The terrain ranges from gradually sloped to steep grade forest and includes some cliff habitat, and one intermittent stream. Soil types found in the proposed management units include Tropohumults-Dystrandepts association, rock land, and Kemo‘o silty clay. Erosion can be significant when slopes are steep because of the high shrink-swell potential of these soils (USSCS 1972).

The elevation of the two proposed management units Ka‘ena and Haili to Keālia in the Waialua coastal area range from near sea level to 244 m (800 ft) (MIP 2003). The terrain ranges from flat shoreline strand habitat to steep rocky slopes. Soil types include rock land, rock outcrop, stony steep land, and Ka‘ena very stony clay (USSCS 1972).

East Makaleha and Manuwai Management Units: Elevation of these proposed MUs in the upper Mokulēi‘a Forest Reserve and Mt Kaala NAR range from 1,400 to 3,800 ft (MIP 2003). The terrain varies from moderate to steep-sided ridge slopes, gentle to moderate gulch bottoms and very steep slopes near the summit. Soil types found in the proposed management units include rock land and Tropohumults-Dystrandepts association. Erosion can be significant when slopes are steep because of the high shrink-swell potential of these soils (USSCS 1972).

The elevation of the single proposed management unit on State land in the Wai‘anae Kai Forest Reserve ranges from 540 m to 670 m (1,800 to 2,200 ft) (MIP 2003). The terrain ranges from steep ridges sides to steep to vertical cliffs. The soil type found in the proposed management unit is rock land (USSCS 1972).

5.5.2 Surface Water Resources. There are no perennial streams in the Pahole, Upper Kapuna, or West Makaleha proposed MUs. However, the Pahole NAR area forms the headwaters that lead to Kawaihāpai Reservoir. And the Upper Kapuna and West Makaleha proposed MUs encompass the headwaters that lead to the Makaleha Stream. The uppermost portions of these valleys are classified as a Class 1 water zone. The objective of class 1 waters as defined by the Hawai‘i Administrative Rules (HAR 11-54-3) is that these waters “remain in their natural state as nearly as possible with an absolute minimum of pollution from any human caused source.”

There are no surface water resources in the Ka‘ena or Haili to Keālia proposed MUs. The nearest body of water to this group is along the Waialua coast to the north, which ranges from 50 to 1000m away.

East Makaleha and Manuwai Management Units: There is one perennial stream in the East Makaleha, and Manuwai proposed managed areas on State land in the Mokulēiʻa Forest Reserve and in Mt. Kaala NAR. The Makaleha intermittent stream within the East Makaleha proposed MU was identified by the 1990 Hawaii Stream Assessment to have Riparian Significance. While the Kiʻikiʻi intermittent stream in the Manuwai proposed MU was determined to have recreational resources present. In addition, intermittent drainages flow from the upper elevations to lower elevations in the proposed managed areas. The uppermost portions of these valleys are classified as a Class 1 water zone (HAR 11-54-3).

There are no surface water resources in the proposed managed area on State land in the Waiʻanae Kai Forest Reserve.

5.5.3 Climatology and Air Quality. Average rainfall in the proposed Pahole, Upper Kapuna, and West Makaleha MUs ranges from 32 to 60 inches per year (Giambelluca et al. 1986). There are no ambient air quality data for this area. The proposed managed areas are natural forest, and there are no man-made structures or emission sources. Therefore it is believed that air quality here is generally good.

Average rainfall in the proposed Kaʻena and Haili to Keālia MUs ranges from 22 to 32 inches per year (Giambelluca et al. 1986). There are no ambient air quality data for this area. The proposed managed areas are a natural coastal zone and ridge-gulch system, and there are no man-made structures or emission sources. Therefore it is believed that air quality here is generally good.

Average rainfall in the East Makaleha and Manuwai proposed MUs ranges from 60 to 78 inches per year (Giambelluca et al. 1986). There are no ambient air quality data for this area. The proposed managed areas are natural forest, and there are no man-made structures or emission sources. Therefore it is believed that air quality here is generally good.

Average rainfall in the proposed Waiʻanae Kai MU ranges from 32 to 40 inches per year (Giambelluca et al. 1986). There are no ambient air quality data for this area. The proposed managed area is a natural forest, and there are no man-made structures or emission sources. Therefore it is believed that air quality here is generally good.

5.5.4 Noise Environment. There are no ambient noise level data for the Pahole, Upper Kapuna, and West Makaleha areas. These proposed managed areas are removed from residential and agricultural areas, and there are no man-made structures. Therefore it is believed that noise conditions here are generally good.

There are no ambient noise level data for the Kaʻena and Haili to Keālia areas. The proposed managed areas are within a remote coastal zone and ridge-gulch system, and there are no man-made structures. Therefore it is believed that noise conditions here are generally good.

There are no ambient noise level data for the East Makaleha and Manuwai area. The proposed managed areas are far removed from residential or agricultural areas, and there are no man-made structures. Therefore, it is believed that noise conditions here are generally good.

There are no ambient noise level data for the Wai‘anae Kai MU area. The proposed managed areas are far removed from residential or agricultural areas and there are no man-made structures exist nearby. Therefore, it is believed that noise conditions here are generally good

5.5.5 Vegetation. Vegetation types in the proposed Pahole, Upper Kapuna, and West Makaleha MUs include Lowland Mesic Forest and Shrubland and Dry Cliff. Dominant species in the Lowland Mesic Forest in the proposed managed areas on State land around the Mākua Valley rim include *Metrosideros polymorpha* and *Diospyros hillebrandii* (Gagne and Cuddihy 1999). Dominant species in the Lowland Mesic Shrubland include *Metrosideros polymorpha, M. tremuloides, Myrsine lessertiana*, *Psychotria hathewayi*, *Bidens torta, Sphenomeris chinensis,* and *Dodonaea viscosa.* Dominant species on the Dry Cliffs include *Bidens spp., Chamaesyce celastroides, Dodonaea viscosa,* and *Heteropogon contortus* (Gagne and Cuddihy 1999). These MUs have alien-dominated forest and shrubland at lower elevations, but upper elevations with stands of native mesic forest and shrubland (MIP 2003).

Vegetation types in the proposed Ka‘ena and Haili to Keālia MUs include Coastal Dry Shrubland and Grassland and Lowland Dry Forest and Shrubland. Coastal Dry Shrubland and Grassland is characterized by *Sida, Myoporuim, Scaevola,* and *Heliotrpium*. The Lowland Dry Forest and Shrubland is characterized by trees such as *Erythrina, Sapindus,* and *Psydrax*, and the shrub *Dodonaea* (Gagne and Cuddihy 1999). Both of the proposed managed areas have a large number of alien grasses and shrubs (MIP 2003).

East Makaleha and Manuwai Management Units: Vegetation types in the proposed managed areas include Montane Wet Forest and Shrubland, Wet Cliff, Lowland Wet Forest and Shrubland, and Lowland Mesic Forest and Shrubland, and at the lower elevations, Lowland Dry Forest and Shrubland (figure 18). The Montane Wet Forest and Wet Cliff communities are characterized by *Dicranopteris linearis* and *Metrosideros polymorpha*, as well as common fern species such as *Sadleria* sp., *Cibotium* sp., and *Athyrium microphyllum*. Other common species include *Broussaisia arguta, Hedyotis* sp., *Bidens macrocarpa*, *Vaccinium* sp., *Melicope* spp., and *Coprosma* spp. (Gagne and Cuddihy 1999). Only a very small component of the proposed managed areas is comprised of Lowland Wet Forest, typically dominated by *Metrosideros polymorpha, Hedytois terminalis, Antidesma platyphyllum, Myrsine lessertiana,* and *Syzygium sandwicensis*. Much of the managed areas are covered by Lowland Mesic Forest. This community is dominated by species such as *Metrosideros polymorpha*, *Psychotria hathewayi, Pouteria sandwicensis, Charpentiera* spp., *Antidesma platyphullum* and *Diospyros hillebrandii*. At the lower elevations, the proposed managed areas are dominiated by Lowland Dry Forest, characterized by trees such as *Erythrina, Sapindus,* and *Psydrax*, and the shrub *Dodonaea* (Gagne and Cuddihy 1999).

Vegetation types in the proposed Wai‘anae Kai MU includes Dry Cliff (figure 20). Dominant species on the Dry Cliffs include *Bidens spp., Chamaesyce celastroides, Dodonaea viscosa,* and *Heteropogon contortus* (Gagne and Cuddihy 1999).

5.5.6 Threatened and Endangered Species. There are 16 rare and endangered plant species and one rare and endangered animal species found in the Pahole, Upper Kapuna, and West Makaleha MUs proposed for management (see Table 5).

Within the Kaʻena and Haili to Keālia proposed MUs there are two rare and endangered plant species (*Chamaesyce celastroides* var. *kaenana* and *Hibiscus brackenridgei*) and no known rare and endangered animal species found in the areas proposed for management.

There are 12 rare and endangered plant species and one endangered snail within the East Makaleha and Manuwai proposed MUs (see table 6).

There are three rare and endangered plant species within the Waiʻanae Kai proposed MU (*Neraudia angulata, Nototrichium humilie, Tetramalopium filiforme*).

5.5.7 Historic and Archaeological Resources. Archaeological records on file with the State of Hawaiʻi Historic Preservation Office (SHPO) show no sites within the Pahole, Upper Kapuna, and West Makaleha proposed managed area.

Archaeological reconnaissance and GPS surveys of multiple fence line routes were done for a group of proposed ungulate exclosures within the State Forestry's Pahole Natural Area Reserve (NAR), including Upper Kapuna in 2003. This reconnaissance program was performed to assess potential impacts to cultural resources prior to construction of the exclosure fences to determine impacts, if any, to known and or previously unrecorded cultural sites. No cultural resources were found in the area.

When the field reconnaissance for the fence layout stage in the Upper Kapuna and West Makaleha fences is undertaken, the Cultural Resources Section crew would investigate and inspect for the presence or absence of cultural resources during an Inventory Survey for Cultural and Archaeological Resources. These field assessments would be coordinated with and be undertaken in conjunction with planned activities of the Army's Natural Resources Section of DPW's Environmental Division sometime in the near future.

At Kaʻena Point the smaller of the two subunits, nearer the western most point of Oʻahu is located on the slope above the rough dirt road (originally the Oʻahu Railway & Land Co.'s 1899 main line right of way) and immediately down slope from Puʻu Pueo. This unit is adjacent to a number of shore side traditional sites on the shore, and a few sites inland as well. Off the tip of the point is the small rock islet named Pohaku o Kauaʻi, which has at least three quite different legends about its origin (see Sterling and Summers 1978:92-5). Near the point on the north facing side is found Leina a Kaʻuhane, or the 'souls leap'. This is a very large sand stone boulder at the shoreline that was the entry way to the 'ancestral spirit realm' where ones' soul departed from this world (Sterling and Summers, 1978). Inland of the old railway-come jeep trail in this area are "a few old house foundations" says McAllister of his Site 186 (in Sterling and Summers 1978:92). This area inland of the old right of way is also the location of the western section of the proposed MU at Kaʻena Point, in the old Kaʻena Point Military Reservation. Presently this is called the Kaʻena (Point) Natural Area Reserve and is listed as Tax Map Key (TMK) 1 6 9 001

030. A couple hundred meters further to the east of Leina a Ka‘uhane (and between the shore and the jeep trail) is McAllister’s Site 187, a *ko`a*, or fishing shrine named Alauiki (Sterling and Summers 1978:97). This is one of a number of named and unnamed *ko`a* found along this rough but very productive coastline. This site is opposite the small gulch in the north facing cliff, the first from the point. The area between that small gulch, named ‘Ālau and the next – Manini defines the eastern section of this Management Unit, in the *ahupua’a* of Ka‘ena. The Plat here is listed as TMK 1 6 9 001 004. On the top of the ridge in the State’s Kuaokala Game Management Area is a medium sized *heiau*, McAllister’s Site 188, named MoKa‘ena (Sterling and Summers 1978:97-8). A note in Sterling and Summers, indicating the sites possible destruction proved to be in error, as discussed below. The low four stepped-platform structure measures 10.7 by 22.9 m (35 by 75 feet). It was partially cleared of brush and tall grasses, and documented by a member of DPW’s Environmental Cultural Resources staff in January 2003. The whole area at the point, both along the shore and up on the bluff near Pu‘u Pueo was part of the Anti Aircraft Artillery Training Camp and its live fire range during WWII. Access to Site 188 is still controlled by the US Air Force.

There are two management subunits that would make up the Haili to Keālia MU. They are located on and above the talus slopes inland of the western third of DMR. The larger, subunit I is in TMKs 6 9 001 003 and 6 8 002 007, and extends from the stream in Haili Gulch on the west, about 300 meters, to an area just to the east of the switch backs of the Keālia Trail, and up the cliff (*pali*) to an elevation of just over 800 feet. Subunit II is 200 m to the east, in TMKs 6 8 002 007 and 6 8 002 018 and is just under 400 feet elevation. There are at least 14 sites (many with multiple features) of traditional and historic significance in this general area, how ever the majority are either on the lower talus to the east of subunit II, or out on the flats within the central section of DMR. A comprehensive Phase II Archaeological contract is underway at DMR and the results of that study would be appended when available.

East Makaleha and Manuwai Management Units: The only known cultural resources or archaeological sites in the vicinity of these MUs are the traditional trails (that have been discussed above). When the field reconnaissance for the fence layout stage in each of these units is undertaken the Cultural Resources Section crew will investigate and inspect for the presence or absence of cultural resources during an inventory survey for cultural and archaeological resources. These field assessments will be coordinated with and be undertaken in conjunction with planned field activities of the Army’s Natural Resources Section of DPW’s Environmental Division sometime in the near future.

Wai‘anae Kai: The small fenced area for this MU is planned for a location on the slope to the west of the summit of the high ridge that separates Mākaha and Wai‘anae Valleys. No physical remains of sites or features have been identified at this specific location, but no known ground surveys have been recorded for the summit area either. Puu Kawiwi, at an elevation of 2975 feet is the most prominent point on the leeward side of the island that is not found along the main Wai‘anae Range and ridgeline. Perhaps the physical dominance and presence of this steep sided ridge and its peak (and the difficulty of access) is part of the reason Kawiwi is a central part of so many accounts and traditional stories about this upland location (refer to Sterling and Summers 1978: 74-6). The concentration of traditional stories about the summit area and its proximity, albeit at much lower elevations of numerous archaeological sites at its base in upper Wai‘anae

Valley, indicates the significance of this landmark. For an introduction to the settlement of this later area of the upper valley see Cordy (2002:56-63).

5.5.8 Land Use. The proposed Pahole, Upper Kapuna Unit II and West Makaleha MUs are within natural areas with no man-made structures. The northern portion of the proposed managed area is a natural area reserve, which has been set aside by the State for protection of natural resources. The Pahole, Upper Kapuna and West Makaleha MUs also fall within Public Hunting Area E. Hunters and hikers access these areas.

The Kaʻena and Haili to Keälia MUs are within natural areas with no man-made structures. A portion of the Kaʻena subunit I a natural area reserve, which has been set aside by the State for protection of natural resources. A popular hiking and mountain biking trail runs through this portion of the proposed managed area. The Kaʻena subunit II has a 4x4 road and trail running through it. A hiking trail runs through a portion of the Haili to Keālia subunit II.

The proposed East Makaleha and Manuwai MUs are within natural areas with no man-made structures. The East Makaleha and Manuwai MUs fall within the Mokuleiʻa State Forest Reserve, and Public Hunting Area E. Hunters occasionally access this area however access is difficult to areas where MUs are proposed as the current roads are not open to public access.

The proposed Waiʻanae Kai MU occurs in a natural area with no man-made structures. It is a State Forest Reserve, and Public Hunting Area G. Surrounding areas are popular with local hunters, however the gulch proposed for management is in an area which is difficult to access and thus is not frequented.

5.5.9 Socioeconomic Environment. The proposed MUs are all in natural areas with no man-made structures. The Pahole, Upper Kapuna, and West Makaleha proposed MUs are between 4 and 4.3 miles from the nearest populated area, Waialua Town. The Kaʻena and Haili to Keālia MUs are approximately 2 miles from Dillingham Air Field and approximately 4 miles from Waialua Town.

The East Makaleha and Manuwai MUs are between 3.0 and 3.3 miles from Waialua Town. While the Waiʻanae Kai MU is roughly 2.13 miles from the Waiʻanae Homestead lots.

5.5.10 Environmental Justice and Protection of Children. See section 4.1.10.

## 5.6 The Nature Conservancy Honouliuli Preserve- Kaluaʻā/Waiʻeli, ʻĒkahanui, and Palikea MUs

5.6.1 Topography and Soils. The elevation of the Kaluaʻā /Waielei MU, ʻĒkahanui MU, and Palikea MU ranges from 463 m to 953 m (1,520 to 3,127 ft) (MIP 2003). The terrain ranges from windward ridge and gulch systems running up to the crest of the Waiʻanae Mountains, to an upper ridge and gulch system comprised of moderate to steep-sided ridge slopes, with steeper slopes near the summit. Soil types include Tropohumults-Dystrandepts association and rock land. The well-drained soils of this area are often underlain by soft weathered rock, volcanic ash

or colluvium. Erosion can be significant when slopes are steep because of the high shrink-swell potential of these soils (USSCS 1972).

5.6.2 Surface Water Resources. There are no perennial streams in any of the three proposed managed areas at Honouliuli Preserve. However, intermittent drainages flow from the upper elevations to lower elevations.

5.6.3 Climatology and Air Quality. Average rainfall in the proposed managed areas ranges from 39 to 59 inches per year, with higher rainfall amounts at higher elevations (Giambelluca et al. 1986). The annual temperature at Honouliuli Preserve averages between 16°C and 32°C (60°F and 90°F). There are no ambient air quality data for this area. The proposed managed areas are natural forest, and there are no man-made structures or emission sources. Therefore it is believed that air quality here is generally good.

5.6.4 Noise Environment. There are no ambient noise level data for this area. The proposed managed areas are remote from any residential or agricultural areas and no man-made structures exist nearby. Therefore, it is believed that noise conditions here are generally good.

5.6.5 Vegetation. Vegetation types in the proposed MUs include Lowland Wet Forest and Shrubland, and Lowland Mesic Forest and Shrubland, and at the lower elevations, Lowland Dry Forest and Shrubland.

Lowland Wet Forest is typically dominated by ʻÖhiʻa (*Metrosideros polymorpha*), Manono (*Hedytois terminalis*), Hame (*Antidesma platyphyllum*), Kölea (*Myrsine lessertiana*), and *Syzygium sandwicensis*. Much of the managed areas are covered by Lowland Mesic Forest. This community is dominated by species such as *Metrosideros polymorpha*, *Psychotria hathewayi, Pouteria sandwicensis, Charpentiera* spp., *Antidesma platyphullum* and *Diospyros hillebrandii*.

5.6.6 Threatened and Endangered Species. There are 53 rare and endangered plant species and 13 rare and endangered animal species, including eight snail species, one bird specie, and four insect species, found in the areas proposed for management (see Table 7).

5.6.7 Historic and Archaeological Resources. Traditionally Honouliuli was the largest *ahupuaʻa* (major land subdivision) and western most of the thirteen that made up the *moku* (district, and sometimes independent chiefdom) of Ewa. Ewa is the district that encompasses the southern half of the central plain of Oʻahu, between the two main mountain ranges, with each of its *ahupuaʻa* fanning out from the waters of Pu ʻuloa (the Hawaiian name for Pearl Harbor). For much of the prehistory of Oʻahu the central district of Ewa was both the population center and the political center of the island. During the time of the aliʻi, (from about 1350 AD on) the Honouliuli *ahupuaʻa* provided fishing grounds, wetland agriculture in the stream bottoms and near the shores of Puʻuloa, dry farming in the middle plains, and native forests where people gathered plants for practical, cultural, and medicinal uses in the uplands. Hawaiians probably farmed the lower forested areas of the Honouliuli ahupuaʻa for kalo (taro, *Colocasia* spp.), uhi (yam, *Dioscorea* spp.), and uala (sweet potato, *Ipomoea batatas*) and lived in some areas.

One of the most recognizable geographic features of the Preserve is Pōhākea Pass, which once served as an important access point between the *moku* of Ewa and Wai‘anae and is also important in Hawaiian oral traditions. Some Hawaiian historical researchers believe that the northern end of the Preserve (Lïhu‘e) may have been part of a major Hawaiian “training ground” for chiefs, in conjunction with Kūkaniloko and its associated surrounding heiau in the area to the north of Wahiawā. Kūkaniloko, while famous as a birthing ground for royalty was much more, serving as the focus for a "university" for many ali‘i. Here they learned astronomy, navigation, botany, methods of warfare, and other arts. Lïhu‘e and the area just to the north were also the location of a number of major battles between various factions on O`ahu in the late pre-contact period.

Large-scale modifications to the lands of upland Honouliuli probably began between 1815 and 1830. At that time, large areas of Hawai‘i’s lowland forests were burned in order to detect standing or fallen sandalwood by the fragrant odor of the smoke. This disturbance was accompanied by the introduction of livestock, such as cattle and goats, which had free range and devastated much of the remaining native vegetation. In 1877, when James Campbell purchased the land that now includes Honouliuli Preserve, he reportedly drove 32,347 cattle off the land. In more recent times, several trails were built in the preserve, including the historic 17-mile Honouliuli Contour Trail, originally constructed by the Civilian Conservation Corps in the 1930s following the request of the US Army Command. Other uses of the lands near the preserve have included sugar cane and pineapple agriculture and internment camps during World War II. Historic sites include Hawaiian cultural sites, such as agricultural terracing, house sites, and other sites, have been identified in the preserve (TNC 2000). Two Archaeological Reconnaissance Surveys have recently been undertaken by DPW’s Cultural Resources Section crew to investigate and inspect a possible archaeological site on the summit of Pu‘u Kaua (3127 feet / 953m elevation), the high point on the ridge to the north of Pōhākea Pass. This is the location of the 203 acre ‘Ēkahanui MU. These field assessments will be reported on in more detail in the near future.

5.6.8 Land Use. The proposed managed areas are all within the Conservation District and are managed by The Nature Conservancy (TNC). TNC manages this area as a Biodiversity Preserve for protection of the forest and rare and endangered species found in the area. Additionally, TNC works with volunteers and community groups to provide access to the preserve for education and hunting activities.

5.6.9 Socioeconomic Environment. The proposed managed areas are all natural areas with no man-made structures. Kunia Village is the closest town to the Kalua‘ā/Waieli, ‘Ēkahanui, and Palikea MUs. These MUs are all between 1.9 and 3.1 miles of Kunia Village.

5.6.10 Environmental Justice and Protection of Children. See section 4.1.10.

## 5.7 Kamehameha Schools Land- Waiawa MU

5.7.1 Topography and Soils. Elevation of the proposed management unit on KS lands ranges from 1,800 to 2,725 ft (MIP 2003). The area is comprised of a series of complex gulch and ridge

systems, with moderate to steep-sided gulches. Soil types found in the proposed managed area include rough mountainous land. This soil type is found in areas of very steep land broken by numerous intermittent drainage channels. Over much of the area, the soil mantle is very thin (USSCS 1972).

5.7.2 Surface Water Resources. There are several intermittent streams in the Waiawa proposed managed area that form the headwaters of the perennial Waiawa Stream which flows into Pear Harbor.

5.7.3 Climatology and Air Quality. Average rainfall in the proposed Waiawa managed area ranges from 118 to 158 inches per year, with higher rainfall amounts at the higher elevation areas (Giambelluca et al. 1986). There are no ambient air quality data for this area. The proposed managed area is a natural forest, and there are no man-made structures or emission sources. Therefore it is believed that air quality here is generally good.

5.7.4 Noise Environment. There are no ambient noise level data for this area. The proposed managed area is remote from any residential or agricultural areas and no man-made structures exist nearby. Therefore, it is believed that noise conditions here are generally good.

5.7.5 Vegetation. Vegetation types in the proposed Waiawa MU include Lowland Wet Forest and Shrubland. Lowland Wet Forest is typically dominated by ʻŌhiʻa (*Metrosideros polymorpha*), Manono (*Hedytois terminalis*), Hame (*Antidesma platyphyllum*), Kōlea (*Myrsine lessertiana*), and ʻŌhiʻa hā (*Syzygium sandwicensis*), and mixed fern assemblages (Gagne and Cuddihy 1999).

5.7.6 Threatened and Endangered Species. There are eight rare and endangered plant species and no known rare and endangered animal species found in the Waiawa Valley area proposed for management (see Table 8).

5.7.7 Historic and Archaeological Resources. Records on file with the State of Hawai‘i Historic Preservation Office (SHPO) show no Archaeological sites or previous surveys at or near the proposed Waiawa MU. When the field reconnaissance for the fence layout stage for this MU is undertaken the Cultural Resources Section crew would investigate and inspect for the presence or absence of cultural resources during an inventory survey for cultural and archaeological resources. These field assessments would be coordinated with and be undertaken in conjunction with planned field activities of the Army's Natural Resources Section of DPW's Environmental Division sometime in the near future.

5.7.8 Land Use. The Waiawa MU proposed for management on KS land is currently not managed. It is private land and not accessible to the public, however the Mānana trail runs along ridgeline, which is the southern boundary of the MU. Hunters may occasionally access this area.

5.7.9 Socioeconomic Environment. The area proposed for management is a natural area and is approximately 4 miles from the Pacific Palisades Subdivision in Pearl City. The area around the proposed MU contains no existing man-made structures.

5.7.10 Environmental Justice and Protection of Children. See section 4.1.10.

## 6. ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND ALTERNATIVES

This section describes the potential environmental consequences associated with the proposed action and the alternative considered. The proposed action is to organize the Army's conservation efforts into MUs, either fenced or unfenced. Within each MU the proposed action includes fencing/ungulate control, alien plant, animal, and invertebrate control, alien invertebrate exclosures, genetic collection of endangered snails and plants, reintroductions/augmentations of rare plants, fire control and erosion control. This section has been organized by resource area to provide a comparative framework for evaluating the impacts of the proposed action and the no action alternative on individual resources. Due to the similar nature of the proposed management actions within the MUs, impacts discussed below generally pertain to all MUs. For MUs where impacts to the environment differ, the effects and mitigation actions are specifically addressed.

6.1 Topography and Soils.

6.1.1 Implementation of Management Plan. Cutting a fence corridor is necessary to permit efficient installation of the fence and remove hazards to work crews. In this process, some soil disturbance and harm to native vegetation is unavoidable. Soil disturbance also occurs when removing alien plant species and reintroducing or augmenting native plant populations. Soil disturbance is expected to be short term with no significant impacts expected and no changes in the normal run-off or percolation are expected. Skirting of the fences would prevent run-off along the edges.

6.1.2 No Action Alternative. Under this alternative the feral ungulate exclusion fences would not be constructed (i.e. no fencing, incipient weed control, small mammal control, ungulate control, etc.) and the feral ungulate populations would continue to cause further destruction to both the native and non-native vegetation resulting in exposed areas of soil susceptible to erosion and increased surface runoff.

6.2 Surface Water Resources.

6.2.1 Implementation of Management Plan. Clearing of vegetation may produce a short-term increase in sedimentation and runoff. Water quality however, would be improved in the long-term by reducing erosion and limiting the input of disease-causing organisms into stream water by feral animals. Controlling the population of feral mammals would likely reduce the incidence of Leptospirosis and other diseases carried by these animals into streams. It is anticipated that there will be no significant impact to water resources from the use of herbicides and small mammal toxicants within the proposed MUs. The project would also increase public awareness of the importance of watershed protection as well as protecting native Hawaiian ecosystems and endangered species for future generations. No significant impacts to water resources are anticipated.

6.2.2 No Action Alternative. This alternative would allow feral animals to remain in the proposed managed areas and possibly increase in numbers. As a result, stream water quality would continue to deteriorate due to fecal matter and the diseases it carries. Additionally, increased erosion and subsequent soil runoff would also contribute to the degradation of water quality.

6.3 Climatology and Air Quality.

6.3.1 Implementation of Management Plan. No significant impacts are anticipated, as the existing conditions would not change as a result of the actions associated with implementing the plan.

6.3.2 No Action. No impacts are anticipated, as the existing conditions would remain.

6.4 Noise Environment.

6.4.1 Implementation of Management Plan. Helicopters would be used to transport workers and materials associated with implementing the plan. As a result, there could be a small increase in noise. However, these impacts are expected to be short-term and insignificant.

6.4.2 No Action. No impacts are anticipated, as the existing conditions would remain.

6.5 Vegetation.

6.5.1 Implementation of Management Plan.

a) An increase in foot traffic would be associated with implementing the plan and could inadvertently lead to the introduction of additional non-native plant species.

   **Mitigation:** To ensure this does not happen, all personnel would follow a strict gear cleaning procedure prior to entering native areas. In the case of accidental non-native plant introductions, the natural resource staff would conduct monitoring surveys and remove any species identified as being noxious.

b) Clearing vegetation prior to building a fence could result in the removal of native elements.

   **Mitigation:** To reduce this effect the natural resource staff would choose the path with the least number of native plants.

c) There is also a chance that immediately after fencing the amount of damage to the native vegetation caused by ungulates could increase due to changes in their normal movement patterns.

   **Mitigation:** To reduce this type of damage, intensive control efforts would be implemented to eliminate those ungulates remaining in the enclosed area. Fencing and ungulate control would lead to the reestablishment of native plant species once ungulates are removed from the fenced enclosure.

d) There is a chance that chemicals used to control non-native plants could drift onto native vegetation and cause damage.

**Mitigation:** To reduce this, the natural resource staff would only apply chemical control under non-windy, clear weather conditions. In addition, a sticking agent would be used to reduce the amount of drift. This action should ultimately lead to a healthier more native forest by controlling the alien plant species known to replace the natives.

Implementation of the mitigation measures above would reduce the potential impacts to native vegetation and no significant impacts are anticipated.

6.5.2 No Action. Under the no action alternative alien plants and animals would remain in their current concentration and will continue to increase in numbers posing a continued threat to native species. As a result, the long-term impacts would be the continued deterioration of the native forest.

6.6 Threatened and Endangered Species.

6.6.1 Implementation of Management Plan. The management plan is a result of close coordination between the US Fish and Wildlife Service and the Army and thus the continued existence and benefit to listed endangered species is the core goal of the Mākua Implementation Plan. All actions planned in the MIP are expected to result in a long-term net benefit to all the listed threatened and endangered species within the proposed management units which would far outweigh any potential short term negative impacts. The management plan would result in control of the threats to the listed species in the area, which should lead to an increase in the number of individuals of these species and an increase in the quality of their habitat.

6.6.2 No Action. Under the no action alternative alien plants and animals would remain in their current concentration and will continue to increase in numbers posing a continued threat to endangered species. Additionally, rare plant populations would continue to decline from predation and habitat loss. As a result, the long-term impacts would be the continued degeneration and eventual extirpation of endangered species populations within the proposed MUs.

6.7 Historical and Archaeological Resources.

6.7.1 Implementation of Management Plan. Construction of a fence and outplanting species could affect unknown cultural sites. Inquiries regarding known archaeological sites with the SHPO were conducted for written records, historic maps, and known archaeological sites.

**Mitigation:** Site-specific cultural resource surveys will be conducted by DOD archaeologists along the proposed fence line routes and outplanting areas prior to

initiation of the activities. All archaeological sites will be avoided. In addition, the Army will consult with the SHPO and native Hawaiians in accordance with Section 106 of the National Historical Preservation Act.

6.7.2 No Action. No impacts are anticipated, as the existing conditions would remain.

6.8 Land Use.

6.8.1 Implementation of Management Plan. Some of the proposed management units are within State Public Hunting Areas E and G. However, access to Public Hunting Area E is difficult as the bottom portions of this hunting area are managed by private landowners and road access is restricted to State workers and private landowners. As a result, hunting in these areas is limited and these areas are infrequently used. The proposed new fencing within the Public Hunting Area E would cover approximately 15% of the currently available hunting area.

There is also a proposed MU within Public Hunting Area G in Waianae Kai which is more easily accessible and more frequently used. However, the proposed MU will cover less than 1% of the available hunting area and will provide significant protection for the native Hawaiian resources in the area.

Additionally, the lands within the TNC Preserve offer hunting opportunities to volunteer hunters, it is expected that the impact would not be significant since the best, most accessible hunting areas within the Preserve would remain unfenced.

The boundary of some MUs are in close proximity to hiking trails that could be affected by fencing. The Army would make every effort to design the fencelines so that they do not cross existing trails. Should it be necessary to cross existing trails, the Army would install fence crossovers or gates.

6.8.2 No Action. No impacts are anticipated, as the existing conditions would remain.

6.9 Socioeconomic Environment.

6.9.1 Implementation of Management Plan. The Proposed Action is not expected to affect job opportunities, population structure, or the use of public facilities. Therefore, no impacts to the social or economic welfare of the nearby communities of Waialua, Wahiawā, Mākaha, Waikele, Waiʻanae, Pearl City, and Kunia are anticipated.

6.9.2 No Action. No impacts are anticipated, as the existing conditions would remain.

6.10 Environmental Justice and Protection of Children.

6.10.1 Implementation of Management Plan. The activities associated with the MIP would be located away from residential communities. Disproportionately high and adverse human

health or environmental impacts on minority and low-income populations and children are not anticipated.

6.10.2 No Action. No impacts are anticipated, as the existing conditions would remain.

## 7. CUMULATIVE IMPACTS

Cumulative impacts were analyzed for each resource category by examining past, present, and reasonably foreseeable future actions along with the Proposed Action (specific actions are described in detail above). In determining cumulative impacts of the Proposed Action all construction of fences and MU management actions were taken into consideration. Under the MIP, a total of 38 management unit, enclosing a total of 2,706 acres would be constructed. Anticipated cumulative impacts of the Proposed Action to the affected environment are discussed below.

7.1 Topography and Soils. Clearing activities for fence construction would result in the loss of vegetative cover, thereby exposing soil and increasing the potential for erosion and surface water runoff. However, soil disturbance associated with the Proposed Action would be minimal and short-term, and the net effects are expected to be positive. The construction of the fence would provide a positive impact as the areas within fenced MUs would be protected from the damaging effects of ungulate digging and associated continuing erosion. Implementation of reasonably foreseeable future actions would also involve minor vegetation removal and reintroduction/augmentation of rare plant species. The potential impacts of these future actions would resemble those from the Proposed Action, resulting in a net positive effect on the immediate and surrounding habitat within the fence. As a result, the cumulative effects of the Proposed Action would provide a positive impact both alone and in combination with reasonably foreseeable future actions.

7.2 Ecosystems and Biological Resources. Potential negative impacts from the Proposed Action to ecosystems and biological resources and specifically endangered species would be minimized by implementing control measures and reliable work practices. As a result, significant adverse impacts are not anticipated. Reasonably foreseeable future projects such as additional fencelines or endangered species collections work outside MUs may occur in nearby locations. However, it is expected that future projects would utilize similar mitigation actions. Consequently, the proposed project would not adversely affect the ecosystems and biological resources, individually, nor would it contribute to the cumulative effects of reasonably foreseeable future actions. Instead, the Proposed Action and reasonably foreseeable future actions are expected to provide a net positive effect at the ecosystem and species levels.

Positive impacts of the Proposed Action include habitat protection within fenced ungulate exclosures, common native plant species regeneration and proliferation in the absence of ungulate pressure, endangered species protection from predators and invasive plant species.

7.3 Visual Quality and Aesthetics. The proposed MUs would be located in a remote areas and potential impacts from clearing and management activities would be minimized by utilizing existing tree canopies to conceal the corridors. Therefore, no significant cumulative impacts are

anticipated to the visual quality or aesthetics of any of the proposed MU areas.

7.4 Water Resources. Increase in sedimentation and runoff generated during the proposed fence construction would be temporary, short in duration, and spread over several different remote locations. The effects from these projects would also be separated temporally as the fence construction projects are proposed over a 10 year period. Additionally, the chemical control of alien plants or animals within MUs is not anticipated to be of sufficient volume to have a significant effect on water resources. As a result, the proposed project would not significantly affect water resources individually, nor would it contribute to the cumulative impacts of reasonably foreseeable future actions.

7.5 Air Quality and Noise. Increase in emissions and noise generated during the Proposed Action of fence construction around MUs would be temporary, short in duration, spread over several different remote locations, and temporally spaced over 10 years. Overall, cumulative impacts would not be significant since the proposed project and reasonably foreseeable future actions would occur at different times.

7.6 Archaeological and Historic Resources. Known archaeological and historical resources would not be adversely affected by the proposed project, as fencelines and management actions would avoid all sites. All proposed MUs and fencelines that have not been surveyed by cultural resources personnel would be surveyed prior to any construction plans so as to avoid all archaeological sites. As a result, the cumulative effects of the Proposed Action would not be significant either alone or in combination with reasonably foreseeable future actions.

**8. Findings and Reasons Supporting the Anticipated Determination**

The goal of the Army's proposed conservation actions outlined in this document is to provide long-term protection and enhancement of native Hawaiian ecosystems and protection and stabilization of plant and animal species potentially affected by military training at Mākua Military Reservation.

The anticipated Finding of No Significant Impact is based on criteria outlined in Chapter 200 (Environmental Impact Statement Rules) of Title 11, Administrative Rules of the State Department of health (§ 11-200-12). The proposed project is discussed in relation to these criteria below.

**1) Involves and irrevocable commitment to loss or destruction of any natural or cultural resource;**

The proposed action will not negatively impact any natural or cultural resource. Rather the proposed action is expected to positively impact both the surrounding environment and the longevity of the affected threatened and endangered species within the proposed managed areas.

**2) Curtails the range of beneficial uses of the environment;**

The proposed action will not curtail the beneficial uses of the environment. The proposed action

will provide long-term protection for native Hawaiian ecosystems against the threats posed by alien plants and animals. The proposed action will improve the condition of the watershed and it's function.

**3) Conflicts with the state's long-term environmental policies or goals and guidelines as expressed in chapter 344, Hawai'i Revised Statutes, and any revisions thereof and amendments thereto, court decisions or executive orders;**

The proposed action is consistent with the long-term environmental policies, goals and guidelines of the state of Hawaii and with the State's mandate to conserve threatened and endangered species, as required by Chapter 195D, HRS.

**4) Substantially affects the economic or social welfare of the community or state.**

The proposed action will not substantially affect the economic or social welfare of the community or the state.

**5) Substantially affect public health.**

Public health will not be adversely affected by the proposed action. Instead, the proposed action may have a positive impact on public health by reducing the density of rats and feral ungulates in the proposed managed areas and enhancing the watershed.

**6) Involves substantial secondary impacts, such as population changes or effects on public facilities.**

Substantial secondary impacts are not anticipated.

**7) Involves a substantial degradation of environmental quality.**

The proposed action is not anticipated to result in any substantial degradation of environmental quality. Rather, environmental quality is expected to increase following the implementation of the proposed action in each proposed managed area as native biota is protected and enhanced and alien plants and animals are controlled.

**8) Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions;**

The proposed action is expected to have a positive effect on native Hawaiian ecosystems and the watershed. The proposed action was planned with a long-term commitment to ecosystem preservation and stabilization of threatened and endangered species.

**9) Substantially affects a rare, threatened or endangered species, or its habitat;**

The proposed action is anticipated to *positively* affect the rare, threatened or endangered species in the proposed managed areas by protecting them from feral ungulates and weed threat.

Numerous rare plants in each proposed managed area will be protected and the surrounding environment will be enhanced.

**10) Detrimentally affects air or water quality or ambient noise levels;**

Some noise will be generated during initial fence construction from helicopter drop off of materials and small power equipment and hand tools. However, all proposed fences are remote from any residential areas. And in the long-term there is expected to be no impacts to air or noise quality. Overall there is expected to be a positive impact to the water quality from the proposed action.

**11) Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.**

The proposed action was designed to protect environmentally sensitive areas from further degradation by feral ungulates and alien plant species.

**12) Substantially affects scenic vistas and view planes identified in county or state plans or studies.**

The proposed action will not substantially affect scenic vistas or view planes of the area. Any fences constructed will be far removed from residential areas.

**13) Requires substantial energy consumption.**

Substantial energy consumption is not anticipated. However, small amounts of energy will be used during fence construction through the use of small power tools and transportation of materials and crew to proposed managed areas.

## 9. CONCLUSION

The long-term benefits of fencing, ungulate control, alien plant, animal, and invertebrate control, alien invertebrate exclosures, genetic collection of endangered snails and plants, reintroductions/augmentations, fire control, and erosion control far outweigh the limited short-term negative effects of these management actions.

Installation of the proposed fences will help to more efficiently and effectively control feral animals in the project areas. Feral pigs and goats pose the greatest threat to existing intact native mesic forest areas. The cumulative effects of feral pigs and goats are the deterioration of intact native forest ecosystems, including the decline of threatened and endangered plants and invertebrates. Removal of feral pigs and goats has been demonstrated to result in the recovery of native vegetation (Stone, Cuddihy, and Tunison 1992). Feral pig and goat removal also controls or significantly reduces the spread of alien plants. Additionally, alien invertebrate control and exclosures will help to preserve endangered plants and snails in their native habitat.

The possibility for introduction of new weed species as a result of human activity exists. Ensuring that the equipment, tools, and construction materials are clean and free of weed seeds can minimize this. Natural resource management and fence construction crews will be instructed in protocols to prevent weed distribution involving their personal gear and movements. This protocol will be strictly enforced.

The genetic collection of endangered snails and plants coupled with reintroductions and augmentations will help to ensure the continued survival of these species in protected, native habitats. Over time the Army hopes that these collection and reintroduction/augmentation efforts will result in the stabilization of these taxa.

Fire and erosion control efforts in and around the proposed project areas will serve to protect and enhance the natural environment as native ecosystems will be protected. Fire and erosion in native Hawaiian ecosystems often result in a further degradation as alien plants generally replace native vegetation after this type of significant disturbance.

Based upon the available information, this EA has concluded that the proposed action does not constitute a major federal action that would significantly negatively affect the quality of the environment. Therefore, an environmental impact statement is not required. A Finding of No Significant Impact (FONSI) will be prepared and public notice given in the State of Hawai‘i Office of Environmental Quality Control (OEQC) Bulletin.

## 10. LIST OF AGENCIES AND PERSONS CONSULTED.

**Consulted Parties**:

Federal:
- U. S. Department of Interior
- U. S. Fish and Wildlife Service
- U. S. Department of Defense
- U. S. Army Garrison, Hawai‘i

State:
- Department of Health
  - Office of Environmental Quality Control
- Department of Land and Natural Resources
  - Division of Forestry and Wildlife-O‘ahu
  - Office of Conservation and Coastal Land Management-O‘ahu
  - Historic Preservation Division
- University of Hawai‘i
  - Hawai‘i Tree Snail Laboratory-Dr. Michael Hadfield

City and County:
- Board of Water Supply
- Neighborhood Boards:
  - Wai‘anae Neighborhood Board

Private:
- Audubon Society
- Conservation Council of Hawai‘i
- Hawaiian Trail and Mountain Club
- Pig Hunters Association of O‘ahu
- The Nature Conservancy of Hawai‘i
- Sierra Club

Mohala I Ka Wai
Ka‘ala Farm, Inc.

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# Appendix

**Weed Control Techniques**

Control of weeds is conducted using a number of techniques, including manual, chemical and biological control. The method of control depends on the growth form of the target species (grass versus shrub versus tree), and the type of weeding project (active restoration versus gradual restoration versus firebreak). Manual and chemical control are often combined. Manual control includes all types of weeding done without the use of herbicide, for example, hand-pulling, grass-cutting, girdling, clipping, and felling. Manual control sometimes involves the use of chainsaws; all NRS take a chainsaw training class prior to use of a chainsaw in the field. In addition, all NRS undergo state certification for application of restricted use pesticides, although no restricted use pesticides or pesticides with a stronger signal word than Caution are used in management. As a rule, NRS strive to use the most effective combination of control techniques to achieve optimum weed control with minimal secondary effects on native plant species. In general, control of canopy weeds is done using a basal bark application of 20% Garlon 4 in Forestry Crop Oil. The following are definitions of the most common control techniques used by NRS:

- Girdle—wound cut into the cambium layer of a tree trunk or shrub encircling its base with a chainsaw or treesaw; herbicide is usually but not always applied to the cut.
- Cut-stump (Flush Cut)—tree or shrub trunk severed near the base; herbicide is usually then applied to the stump.
- Frill-cut—wound cut with a hatchet or machete into the cambium of a tree trunk or shrub encircling the base, leaving the removed bark attached at the base to act as a trough for herbicide if applied.
- Foliar spray—herbicide sprayed on the leaves of a plant.
- Basal bark/Thin line—herbicide is squirted in a ring around the base of a weed trunk or stem.
- Clip and drip—small stemmed weeds cut with pruners or loppers; herbicide is applied to the cut surface.
- Weedwhacking—for grassy species; grass cut low to ground, herbicide is usually applied to new growth.
- Handpulling—for young woody species or herbaceous species; entire plants are pulled from ground, including majority of roots.
- EZJECT—.22 caliber shells filled with water-soluble systemic herbicide (either Garlon or Round-up) are injected directly into stems or rhizomes; shells pushed into plants using EZJECT injection equipment, hammer, or hand pressure.

NRS have relied on other natural area managers' experience or their own set of efficacy control plots to determine products used to kill introduced plant species. Products used by NRS include:

- Garlon 4—a systemic herbicide diluted in FCO; applied generally as a basal bark treatment. Active ingredient: 61.6% triclopyr
- Forestry Crop Oil (FCO) —an oil-based carrier used in thin line treatments with Garlon 4 to improve penetration through bark and other plant tissue.
- Glypro Plus—a non-specific, systemic herbicide diluted in water; applied generally in low concentrations. The patent on Round-up recently expired; Glypro Plus is a replacement for Round-up, and functions in much the same way. Active Ingredient: 41.0% glyphosate.

- Fusilade II—a grass specific herbicide diluted in water; most frequently applied as a foliar spray. Active ingredient: 24.5% fluazifor-P-butyl.
- Escort—a systemic herbicide diluted in water; sprayed on the rhizomes of ginger. Active ingredient: 60% metsulfuron methyl.

To reduce the risk of an accidental spill all herbicide concentrates are stored over a secondary containment and mixed over an impermeable surface. Additionally, herbicide application is restricted to dry vegetation and all are biodegradable in soil. NRS document how much herbicide is used in each area that is treated for each application.


PULL HERE TO OPEN
FUSILADE® II
Turf and Ornamental Herbicide
For the control of grass weeds in landscape areas, roadsides, nurseries, greenhouses, flower beds, groundcovers, interiorscapes, parks, sports fields, golf courses, commercial and residential areas.
Active Ingredient:
Fluazifop-P-butyl
Butyl
(R)-2-[4-[[5-(trifluoromethyl)-2-pyridinyl]oxy]
phenoxy]propanoate* 24.5%
Other Ingredients 75.5%
Total: 100.0%
*Fusilade II Turf and Ornamental Herbicide contains 2 pounds (+) isomer (fluazifop-P-butyl) per gallon.
Contains petroleum hydrocarbons.
KEEP OUT OF REACH OF CHILDREN.
CAUTION
See additional precautionary statements and directions for use inside booklet.
EPA Reg. No. 100-1084
EPA Est. 11773-IA-01VWC
EPA Est. 46073-TN-003NTM
(Superscript is first three letters of batch code on container.)
Product of United Kingdom
Formulated in the USA
SCP 1084A-L1A 1203
1 quart
Net Contents
syngenta

| FIRST AID | |
|---|---|
| **If on skin or clothing** | • Take off contaminated clothing.<br>• Rinse skin immediately with plenty of water for 15-20 minutes.<br>• Call a poison control center or doctor for treatment advice. |
| **If inhaled** | • Move person to fresh air.<br>• If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible.<br>• Call a poison control center or doctor for further treatment advice. |
| **If in eyes** | • Hold eye open and rinse slowly and gently with water for 15-20 minutes.<br>• Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.<br>• Call a poison control center or doctor for treatment advice. |
| **If swallowed** | • Call a poison control center or doctor immediately for treatment advice.<br>• Do not give any liquid to the person.<br>• Do not induce vomiting unless told to do so by a poison control center or doctor.<br>• Do not give anything by mouth to an unconscious person. |
| Have the product container or label with you when calling a poison control center or doctor, or going for treatment. | |
| **HOT LINE NUMBER**<br>For 24 Hour Medical Emergency Assistance (Human or Animal) or<br>Chemical Emergency Assistance (Spill, Leak, Fire, or Accident),<br>Call<br>**1-800-888-8372** | |

## PRECAUTIONARY STATEMENTS

**Hazards to Humans and Domestic Animals**

**CAUTION**

Harmful if absorbed through skin or inhaled. Causes eye irritation. Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals. Avoid contact with skin, eyes or clothing. Avoid breathing vapor or spray mist.

### Personal Protective Equipment (PPE)

Some materials that are chemical-resistant to this product are listed below. If you want more options, follow the instructions for Category E on an EPA chemical resistance category selection chart.

**Applicators and handlers (other than mixers and loaders) must wear:**

- Long-sleeved shirt and long pants
- Chemical-resistant gloves, such as barrier laminate or nitrile rubber or viton or neoprene rubber
- Shoes plus socks

**Mixers and Loaders must wear:**

- Long-sleeved shirt and long pants
- Chemical-resistant gloves, such as barrier laminate or nitrile rubber or viton or neoprene rubber
- Shoes plus socks
- Protective eyewear
- Chemical-resistant apron when mixing or loading

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

### Engineering Control Statements

When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240(d)(4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

### User Safety Recommendations

**Users should:**

- Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

### Environmental Hazards

This product is toxic to fish. Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment washwaters. Do not apply when weather conditions favor drift from target area.

**Physical or Chemical Hazards**
Do not use or store near heat or open flame.

## CONDITIONS OF SALE AND LIMITATION OF WARRANTY AND LIABILITY

**NOTICE:** Read the entire Directions for Use and Conditions of Sale and Limitation of Warranty and Liability before buying or using this product. If the terms are not acceptable, return the product at once, unopened, and the purchase price will be refunded.

The Directions for Use of this product should be followed carefully. It is impossible to eliminate all risks inherently associated with the use of this product. Crop injury, ineffectiveness or other unintended consequences may result because of such factors as manner of use or application, weather or crop conditions, presence of other materials or other influencing factors in the use of the product, which are beyond the control of SYNGENTA CROP PROTECTION, INC. or Seller. All such risks shall be assumed by Buyer and User, and Buyer and User agree to hold SYNGENTA and Seller harmless for any claims relating to such factors.

SYNGENTA warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes stated in the Directions for Use, subject to the inherent risks referred to above, when used in accordance with directions under normal use conditions. This warranty does not extend to the use of this product contrary to label instructions, or under abnormal conditions or under conditions not reasonably foreseeable to or beyond the control of Seller or SYNGENTA, and Buyer and User assume the risk of any such use. SYNGENTA MAKES NO WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE NOR ANY OTHER EXPRESS OR IMPLIED WARRANTY EXCEPT AS STATED ABOVE.

In no event shall SYNGENTA or Seller be liable for any incidental, consequential or special damages resulting from the use or handling of this product. **THE EXCLUSIVE REMEDY OF THE USER OR BUYER, AND THE EXCLUSIVE LIABILITY OF SYNGENTA AND SELLER FOR ANY AND ALL CLAIMS, LOSSES, INJURIES OR DAMAGES (INCLUDING CLAIMS BASED ON BREACH OF WARRANTY, CONTRACT, NEGLIGENCE, TORT, STRICT LIABILITY OR OTHERWISE) RESULTING FROM THE USE OR HANDLING OF THIS PRODUCT, SHALL BE THE RETURN OF THE PURCHASE PRICE OF THE PRODUCT OR, AT THE ELECTION OF SYNGENTA OR SELLER, THE REPLACEMENT OF THE PRODUCT.**

SYNGENTA and Seller offer this product, and Buyer and User accept it, subject to the foregoing Conditions of Sale and Limitation of Warranty and Liability, which may not be modified except by written agreement signed by a duly authorized representative of SYNGENTA.

## DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

This labeling must be in the possession of the user at the time of application.

**AGRICULTURAL USES: COMMERCIAL SOD FARMS, ORNAMENTALS GROWN IN COMMERCIAL GREENHOUSES AND NURSERIES**

### AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE), and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 12 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

- Coveralls
- Chemical-resistant gloves, such as barrier laminate or nitrile rubber or viton or neoprene rubber
- Shoes plus socks

**NON-AGRICULTURAL USE REQUIREMENTS**

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard for agricultural pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries, or greenhouses. The area being treated must be vacated by unprotected persons.

Do not treat areas while unprotected humans or domestic animals are present in the treatment areas. Do not allow entry into treated areas without protective clothing until sprays have dried. Because certain states may require more restrictive reentry intervals for various crops treated with this product, consult your State Department of Agriculture for further information.

Written or oral warnings must be given to workers who are expected to be in a treated area or in an area about to be treated with this product. When oral warnings are given, warnings shall be given in a language customarily understood by workers. Oral warnings must be given if there is reason to believe that written warnings cannot be understood by workers. Warnings must include the following information:

**CAUTION:** Area treated with Fusilade II Turf and Ornamental Herbicide on (date of application). Do not enter without appropriate protective clothing until sprays have dried. In case of accidental exposure to pesticide spray, wash the skin thoroughly with soap and water. Remove contaminated clothing and wash before reuse. If in eyes, flush with plenty of water. If irritation persists, get medical attention.

## STORAGE AND DISPOSAL

### Prohibitions

Do not contaminate water, food or feed by storage or disposal. Open dumping is prohibited. Do not reuse empty container.

### Storage

Store in original container only. Keep container closed when not in use. Do not store near food or feed. In case of spill or leak on floor or paved surfaces, soak up with sand, earth or synthetic absorbent. Remove to chemical waste area.

### Pesticide Disposal

Pesticide wastes are toxic. Improper disposal of excess pesticide, spray mixture or rinsate is a violation of Federal law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency or the Hazardous Waste Representative at the nearest EPA Regional Office for guidance.

### Container Disposal

Triple-rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, by incineration or, if allowed by state and local authorities, by burning. If burned stay out of smoke.

## GENERAL INFORMATION

Read all label directions before using.

Fusilade II Turf and Ornamental Herbicide is a postemergence herbicide for control of annual and perennial grass weeds in ornamentals and certain turf grasses. Fusilade II Turf and Ornamental Herbicide does not control broadleaf weeds or sedges (nutgrass). Fusilade II Turf and Ornamental Herbicide may be applied directly over the top of ornamentals or as a directed spray. Refer to the Ornamental Plant Tables for specific plant safety.

Fusilade II Turf and Ornamental is a systemic herbicide which moves from the treated foliage into the shoots, roots, rhizomes, stolons, and growing points (meristematic regions) of treated grass weeds.

Fusilade II Turf and Ornamental Herbicide is rainfast in one hour.

### CONTROL SYMPTOMS

Growth of treated grass weeds stops soon after application. Symptoms include loss of vigor, yellowing and/or reddening, and eventual death to the treated grass plant. Symptoms are generally observed within 7-14 days after treatment, depending on grass weed species and environmental conditions. Complete control occurs from 10-21 days following application.

### INFORMATION ON WEED RESISTANCE

Naturally occurring biotypes of certain grass species with resistance to this herbicide and related products (same mode of action) are known to exist. Selection of resistant biotypes, through repeated use of these herbicides, may result in control failures.

If poor performance cannot be attributed to adverse weather conditions or improper application methods, a resistant biotype may be present. In such a case, additional treatments with this herbicide or related products is not recommended. Consult your local company representative or agricultural advisor for assistance.

## APPLICATION DIRECTIONS

Thorough coverage of all weed plant foliage is important for good activity. Optimum weed control is achieved when young actively growing weeds are treated that are not under stress from moisture, temperature, low soil fertility, mechanical, or chemical injury.

**TIMING –** Best control of susceptible grasses is obtained when Fusilade II Turf and Ornamental Herbicide is applied to actively growing grasses before they exceed the recommended growth stages shown on this label. Refer to the grass weed table for specific recommendations on weed growth stages.

For best control, use sufficient spray volume and pressure to ensure complete coverage of the target grasses. Apply in 1-2 gallons final spray per 1,000 sq. ft. with spray pressures of 40-60 psi at the nozzle tip. When grass foliage is dense, use 60 psi and a minimum of 2 gallons per 1,000 sq. ft. to ensure coverage of weed foliage. Do not exceed the maximum application rates for Fusilade II Turf and Ornamental Herbicide.

**Always add a high quality nonionic surfactant** containing at least 75% surface-active agent, at 0.25-0.5% v/v (1/2-1 pint per 25 gallons) of the finished spray volume for ground sprays.

**FOR BEST RESULTS, DO NOT USE FLOOD TYPE OR OTHER SPRAY NOZZLE TIPS WHICH DELIVER COARSE, LARGE DROPLET SPRAYS.**

**FOR BEST RESULTS, DO NOT APPLY FUSILADE II TURF AND ORNAMENTAL HERBICIDE WITH CONTROLLED DROPLET APPLICATORS (CDA) OR ANY SIMILAR DEVICES.**

**DO NOT APPLY THIS PRODUCT THROUGH ANY TYPE OF IRRIGATION SYSTEM.**

Disturbance (such as mowing, hand weeding, etc.) of treated grasses is not recommended within 7 days prior to or within 7 days after application of Fusilade II Turf and Ornamental Herbicide, as weeds may be put under stress, reducing weed control. Timely cultivation 2-3 weeks before or after applying Fusilade II Turf and Ornamental Herbicide may assist weed control.

- Apply to actively growing grasses. Application to grasses which are stressed due to moisture, temperature, low soil fertility, mechanical or chemical injury may result in reduced weed control.
- For best results, apply at the recommended rate to grasses at the recommended growth stages as outlined in Table 5 - Annual and Perennial Grass Controlled by Fusilade II Turf and Ornamental Herbicide. Application to grasses which have tillered, formed seed heads, or exceeded recommended growth stages may require additional treatment.
- Apply when the first grass weed species in a mixed grass weed population reaches the recommended growth stage for treatment. Use the highest recommended rate for grasses in that group.
- Where irrigation is used, best results may be obtained when Fusilade II Turf and Ornamental Herbicide is applied within 7 days after irrigation.
- Best perennial grass control can be obtained if rhizomes or stolons are cut up by hoeing, etc., to stimulate maximum emergence of grass shoots.
- Avoid drift to all other crops and nontarget areas. Grass crops are highly susceptible to Fusilade II Turf and Ornamental Herbicide.
- For established turf, do not reseed desirable grasses to treated areas for 14 days following the application. For bare ground areas which have been treated, wait 30 days to reseed.
- Fusilade II Turf and Ornamental Herbicide may be tank mixed with other pesticides, liquid fertilizers or any other additives according to this label or if local experience indicates that each product on the tank mix are safe to the treated crop.
- Sequential applications of other herbicides except as specified on this label or on supplemental labeling within five days before or after Fusilade II Turf and Ornamental Herbicide application may result in ornamental injury and/or reduced grass control.
- Thoroughly clean spray tank with water and a commercial tank cleaner before and after each use.
- Reduced grass control may be observed if rainfall or irrigation occurs within one hour of application.
- DO NOT GRAZE ANIMALS IN TREATED AREAS OR FEED TREATED PLANTS.
- REFER TO GRASS WEED TABLES FOR SPECIFIC RECOMMENDATIONS ON WEED GROWTH STAGES.
- **NOTICE TO BUYER AND USER:** It is impossible to test every species and variety or cultivar of ornamental or nursery plants under all conditions. Plant tolerance of pesticides vary as conditions vary. Plant tolerance of Fusilade II Turf and Ornamental Herbicide at label rates has been found to be acceptable within the ranges specified for the indicated genera and species. Neither the manufacturer nor the seller has determined whether or not Fusilade II Turf and Ornamental Herbicide can safely be used on plants not specified on this label. The professional user should determine if Fusilade II Turf and Ornamental Herbicide can be used safely prior to use.

Fusilade II Turf and Ornamental Herbicide may be applied as an over-the-top spray or a directed spray application in ornamentals.

## APPLICATION RATES

For landscaped areas, roadsides, field grown ornamentals, greenhouses, nurseries, flower beds and all other non-turf areas:

Apply 0.4-0.6 oz./1000 sq. ft. (16-24 oz./A) of Fusilade II Turf and Ornamental Herbicide in sufficient water along with 0.25% (1/2 pt./25 gals.) of a nonionic surfactant. Use only nonionic surfactant on ornamentals. **DO NOT USE A CROP OIL CONCENTRATE WITH FUSILADE II TURF AND ORNAMENTAL HERBICIDE ON ORNAMENTALS.**

**Table 1. Over-the-Top Applications May be Applied to the Following Ornamentals. Use only nonionic surfactants on ornamentals.**

| COMMON NAME/VARIETY | SCIENTIFIC NAME |
|---|---|
| Abelia, Glossy | *Abelia grandiflora* |
| Acacia, Jim wheat | *Acacia schafnerii* |
| Acacia, Shoe-string | *Acacia stenophylla* |
| Acacia, Willow | *Acacia saligna* |
| Acacia, Willow-leafed | *Acacia salacina* |
| Ageratum spp. | *Ageratum spp.* |
| Almond, Flowering | *Prumus trialoba* |
| Aloe, Barbados | *Aloe barbadensis* |
| Aloe vera | *Aloe vera* |
| Aloe zanzibarica | *Aloe zanzibarica* |
| Alyssum spp. | *Alyssum spp.* |
| Ash, American Mountain | *Sorbus americana**** |
| Ash, Arizona | *Fraxinus velutina* |
| Ash, Green | *Fraxinus pennsylvanica**** |
| Ash, White | *Fraxinus americana**** |
| Asparagus, Myres | *Asparagus densiflorus* |
| Asparagus, Sprenger | *Asparagus densiflorus* |
| Aucuba | *Aucuba japonica* |
| Aucuba japonica variegata | *Aucuba japonica variegata* |
| Aurea | *Philadelphius coronarius* |
| Banana, Ethiopia | *Musa maurelli* |
| Banksia | *Rosa Banksiae* |
| Barberry, Mentor | *Berberis mentorensis* |
| Barberry, Redleaf Japanese | *Berberis thunbergii**** |
| Bearberry, Red | *Arctostaphylos uva-ursi* |
| Begonia, Scarletta | *Begonia Semperflorens cultoreum**** |
| Bellflower | *Campanula carpatica* |
| Birch, Eastern white | *Betula pendula**** |
| Bird, Giant of paradise | *Strelitzia nicolai* |
| Bird of paradise | *Caesalpinia gilliesii* |
| Bird of Paradise | *Strelitzia reginae* |
| Bittle bush | *Encelia farinosa* |
| Bottle-brush | *Callistemon lanceolatus* |
| Bougainvilea spp. | *Bougainvilea spp.* |
| Boxwood, Common | *Buxus sempervirens* |
| Boxwood, Japanese | *Buxus microphylia var. japonica* |
| Boxwood, Korean | *Buxus microphylia koreana* |
| Buckthorn, Tallhedge | *Rhamnus frangula* |
| Burningbush, Compact | *Kochia scoparia f. trychophylla* |
| Bush, Lily-of-the-Valley | *Pieris japonica* |

| COMMON NAME/VARIETY | SCIENTIFIC NAME |
|---|---|
| Bush, Purple hopseed | *Dodonea viscosa purplurea* |
| Cactus, Barrel | *Ferocactus spp.* |
| Cactus, Cholla | *Opuntia Cholla* |
| Cactus, Hedgehog | *Echinocatus spp.* |
| Cactus, Saguaro | *Carnegiea gijantea* |
| Caesalpinia cacalaco | *Caesalpinia cacalaco* |
| Camelia | *Camelia japonica* |
| Camelia, Sasanqua | *Camelia sasanqua* |
| Cape weed | *Arctotheca calendula* |
| Carissa tuttlei | *Carissa tuttlei* |
| Cassia, African | *Cassia didymobrotrya* |
| Cassia, Feathery | *Cassia artemisioides* |
| Cassia sturdii | *Cassia sturdii* |
| Centaurea, Dusty miller | *Centaurea cineraria* |
| Century plant | *Agave americana* |
| Cerastium, Snow in summer | *Cerastium tomentosum* |
| Ceratoria, Carob tree | *Ceratoria siliqua* |
| Cercis, Red bud | *Cercis canadiensis* |
| Cherry, Australian bush | *Syzgium paniculatum* |
| Cherry, Brush | *Eugenia myrtifolia* |
| Cherry, Carolina | *Prunus caroliniana ompacta* |
| Chives | *Allium schoenoprasum* |
| Cleyera | *Cleyera spp.* |
| Cleyera | *Ternstroemia gymnanthera* |
| Clover, Pink | *Polygonum capitatum* |
| Coffee | *Coffea arabica* |
| Coleus | *Coleus x hybridus** |
| Coleus, Jade wizard | *Coleus x hybridus* |
| Coolibah, Gum-barked | *Eucalyptus microtheca* |
| Coreopsis, Threadleaf | *Coreopsis verticillata* |
| Coronet, Orange | *Calendula officinalis** |
| Cotoneaster | *Cotoneaster microphyllus* |
| Cotoneaster | *Cotoneaster repens* |
| Cotoneaster apiculata | *Cotoneaster apiculata* |
| Cotoneaster, Coral beauty | *Cotoneaster dammeri* |
| Cotoneaster, Royal beauty | *Cotoneaster dammeri* |
| Cotoneaster, Spreading | *Cotoneaster divaricatus* |
| Cotoneaster, Willowleaf | *Cotoneaster salicifolius franch* |
| Crabapple, Showy | *Malus floribunda* |
| Cranesbill | *Geranium pratense* |
| Creeper, Blue star | *Isotoma spp.* |
| Crossandra | *Crossandra nilotica* |
| Croton | *Codiaeum variegatum* |
| Crown Vetch | *Vicia spp.* |
| Cypress, Allum lawson | *Chamaecyparis lawsoniana* |
| Cypress, Cripps hinoki false | *Chamaecyparis obtusa* |
| Cypress, Italian | *Cupressus sempervirens* |
| Daisy, Shasta | *Chrysanthemum x superbum* |

| COMMON NAME/VARIETY | SCIENTIFIC NAME |
|---|---|
| Daisy, White africans | *Osteospermum fruticosum alba* |
| Daylily | *Hemerocallis hybrids* |
| Deutzia, Slender | *Deutzia gracilis* |
| Dianthus, Sweet William | *Dianthus barbatus* |
| Dogwood, Cornelia cherry | *Cornus mas* |
| Dogwood, Flaviramea | *Cornus sericea* |
| Dogwood, Flowering | *Cornus florida* |
| Dogwood, Red twig | *Cornus sericea* |
| Dumbcane, Giant | *Dieffenbachia amoena* |
| Emerald mound | *Lonicera xylosteum* |
| Eranthemum, Purple false | *Pseuderanthemum atropurpureum* |
| Erythrina, Fastadiata | *Erythrina fusca* |
| Erythrina, Swamp immortella | *Erythrina fusca* |
| Escallonia fradessii | *Escallonia fradessii* |
| Escallonia rubra | *Escallonia rubra* |
| Euonymus fortunei | *Euonymus fortunei* |
| Euonymus, Siebold | *Euonymus alata* |
| Euonymus, Silver king | *Euonymus japonica* |
| Euonymus, Spreading | *Euonymus kiautschovicus* |
| Euryops | *Euryops pectinatus* |
| Evergreen, Fransher | *Aglanoema commutatum* |
| Evergreen, Painted | *Aglanoema crispum* |
| Evergreen, Silver queen | *Aglanoema commutatum* |
| Evergreen, Treubii ribbon | *Aglanoema commutatum* |
| Fatshedera | *Fatshedera lizei* |
| Fern, Desert tree | *Lysiloma thornberii* |
| Fern, Leatherleaf | *Rumohra adiantiformis* |
| Fern, Sword | *Nephrolepsis exaltata* |
| Fig, Creeping | *Ficus repens* |
| Fig, Exotica weeping | *Ficus benjamina* |
| Fig, Trailing hottentot | *Carpobrotus chilensis** |
| Fir, Balsam | *Abies balsamea** |
| Fir, Concolor | *Abies concolor* |
| Fir, Douglas | *Pseudotsuga mensiessi* |
| Fir, Noble | *Abies procera* |
| Firethorn | *Pyracanths graberi* |
| Firethorn, Mojave | *Pyracanths koidzumii x coccinea* |
| Firethorn, Scarlet, Lalandei | *Pyracanths coccinea* |
| Firethorn, Variegated | *Pyracanths angustifolia* |
| Flower, Spider | *Grevillea rosmarinifolia* |
| Forsythia intermedia | *Forsythia intermedia* |
| Forsythia spp. | *Forsythia spp.* |
| Forsythia, weeping | *Forsythia suspensa* |
| Forsythia x intermedia | *Forsythia x intermedia* |
| Gardenia, dwarf | *Gardenia jasminoides* |
| Gardenia, Tahitian | *Gardinia taitensis* |
| Gay feather | *Liatris spicata* |

| COMMON NAME/VARIETY | SCIENTIFIC NAME |
|---|---|
| Gazania gold rush | *Gazania splendens* |
| Gazania uniflora leucoleana | *Gazania uniflora leucoleana* |
| Geranium | *Pelargonium domesticum* |
| Geranium, Ivy | *Pelargonium peltatum* |
| Geranium, Smash Hit Red | *Pelargonium x hortorum** |
| Gimlet, Narrow-leaf | *Eucalyptus spathulata* |
| Gladiolus, Debbie, Jennie, Mahoganny, stargazer | *Gladiolus x hortulanus* |
| Grapefruit | *Citrus paradist* |
| Grapholly, Oregon | *Magnolia spp.* |
| Grass, Red fountain | *Pennisetum setaceum* |
| Gum, Desert | *Eucalyptus rudis* |
| Gum, Red | *Eucalyptus rostrata* |
| Gum, Red box | *Eucalyptus polyanthemus* |
| Hackberry | *Celtis occidentalis** |
| Hawthorn, Yedda / Indian | *Raphiolepsis unbellata* |
| Heather, Scotch | *Calluna vulgaris* |
| Hemlock, Eastern | *Tsuga canadensis* |
| Hen and chickens | *Sempervivum tectorum* |
| Hesperaloe parviflora | *Hesperaloe parviflora* |
| Hibiscus, Althea | *Hibiscus syriacus* |
| Hibiscus, Chinese | *Hibiscus rosa-sinensis* |
| Holly, American | *Ilex opaca* |
| Holly, Dwarf buford | *Ilex cornuta* |
| Holly, Fosteri | *Ilex x attenuata* |
| Holly, Japanese | *Ilex crenata* |
| Holly, Meserve | *Ilex x Meserveae* |
| Hollyhock | *Alcea rosa* |
| Honey locust / shade master | *Gleditsia triancanthos var. inermis* |
| Honeysuckle, Bush | *Diervila Ionicera* |
| Honeysuckle, Cape | *Tecomaria capensis* |
| Honeysuckle, Marrow | *Lonicera x marrowii* |
| Hosta, Variegated | *Hosta lanciflora* |
| Hydrangea, Oakleaf | *Hydrangea querciflora* |
| Hydrangea, Panicle | *Hydrangea paniculata* |
| Iberis, Candytuff | *Iberis sempervirens* |
| Ice plant, Purple trailing | *Mesembryanthemum drosanhemum productus* |
| Ice plant, Red spike | *Mesembryanthemum lampranthus spectabilis* |
| Ice plant, Rose | *Mesembryanthemum drosanhemum hispidum* |
| Indigo, Firecracker, Mexican | *Justicia spicigera* |
| Inkberry, Compact | *Ilex glabra* |
| Iris | *Iris spp.* |
| Ironwood | *Olneya tesota* |
| Ivy, Algerian | *Hedera canariensis* |
| Ivy, Ellen Danica, grape | *Cissus rhombifloia* |
| Ivy, English | *Hedera helix* |
| Ivy, Hahn's | *Hedera helix hahnii* |

| COMMON NAME/VARIETY | SCIENTIFIC NAME |
|---|---|
| Ixora | *Ixora coccinea* |
| Jacaranda | *Jacaranda acutifolia* |
| Jacobina ghiesbreghtiana | *Jacobina ghiesbreghtiana* |
| Jasmine, Star | *Trachelospermum jasminoides* |
| Jasmine, Asiatic | *Trachelospermum asiaticum* |
| Jessamine, Carolina | *Gelsemium sempervirens* |
| Jojoba | *Simmiondsia chinensii* |
| Juniper, Admiral | *Juniperus horizontalis**** |
| Juniper, Cologreen | *Juniperus scopulorum* |
| Juniper, Red ceder | *Juniperus virginiana* |
| Lantana, Bush | *Lantana camera* |
| Lantana, Purple (trailing) | *Lantana sellowiana* |
| Lantana, Twistwood | *Viburnum lantana**** |
| Lantana, Wayfaring tree | *Viburnum lantana**** |
| Laurel, Indian | *Ficus microcarpa nitida* |
| Laurel, Indian | *Ficus nitida* |
| Legume, O'Conners | *Trifolium fragiferum* |
| Lentago, Nannyberry | *Viburnum lentago**** |
| Leptospermum laevigatum | *Leptospermum laevigatum* |
| Ligustrum, Amur River | *Ligustrum amurense* |
| Ligustrum, Privet / California | *Ligustrum ovalifolium* |
| Ligustrum, Texas privet | *Ligustrum texanum* |
| Ligustrum, Vicari | *Ligustrum x Vicari* |
| Ligustrum, Wax | *Ligustrum lucidum* |
| Lilac, James McFarlane | *Syringa villosa* |
| Lilac, Korean | *Syringa patula* |
| Lily, Kaffir | *Clivia miniata* |
| Lily of the Nile, Peter Pan | *Agapanthus africanus* |
| Linden, Little-leaf | *Tilia cordata**** |
| Liriope | *Liriope spicata* |
| Liriope, Green / Variegated | *Liriope muscari* |
| Magnolia, Southern | *Magnolia grandiflora* |
| Magnolia, Star | *Magnolia stellata* |
| Mahonia | *Mahonia aquifolium* |
| Mahonia, King's Ransom | *Mahonia wagoneri**** |
| Maple, Flame amur | *Acer ginnala**** |
| Maple, Japanese | *Acer palmatum* |
| Maple, Norway | *Acer platanoides* |
| Maple, Silver | *Acer sacharinum**** |
| Maple, Sugar | *Acer sacharum* |
| Marigold | *Calendula spp.* |
| Marigold | *Tagetes spp.* |
| Mesquite, Chilean | *Prosopis chilensis* |
| Morningglory, Bush | *Convolvulus oneorum* |
| Myoponum, Prostrate | *Myoponum parvifolium* |
| Myrtle, Crepe | *Lagerstroemia indica* |
| Myrtle, Wax | *Myrica cerifera* |

| COMMON NAME/VARIETY | SCIENTIFIC NAME |
|---|---|
| Oak, live | *Quercus virginiana* |
| Oak, Pin | *Quercus palustris**  |
| Oak, Silk | *Grevillea robusta* |
| Ocotillo | *Fouqueria splendens* |
| Odocanthus spp. | *Odocanthus spp.* |
| Oleander, Pink, variegated, petite | *Nerium oleander* |
| Olive, Osmanthus, tea | *Osmanthus fragrans* |
| Olive, Russian | *Elaeagnus angustrifolia* |
| Olive tree | *Olea europaea* |
| Ongerops, Acacia | *Acacia redolens* |
| Orange, Sour | *Citrus aurantium* |
| Pachysandra, Japanese | *Pachysandra terminalis* |
| Pagoda flower | *Clerodendrum speciosum* |
| Palibin | *Syringa meyeri* |
| Palm, Canary Island date | *Phoenix canariensis* |
| Palm, Chinese fan | *Livistona chinensis* |
| Palm, Golden fruited (small) | *Chrysalidocarpus lutescens* |
| Palm, Mediterranean fan | *Chamaerops humilis* |
| Palm, Mexican fan | *Washington robusta* |
| Palm, Pygmy date | *Phoenix roebelenii* |
| Palm, Queen | *Acrecastrum romanzoffianum* |
| Palm Queen | *Cocos plumosa* |
| Palm, Sago | *Cycus revoluta* |
| Palm, Windmill | *Chamaerops excelsa* |
| Palo Verde, green | *Parkensonia aculeata* |
| Panax, Parsley | *Polyscias fruticosa* |
| Passion vine | *Passiflora pfordtii* |
| Pear, Bradford | *Pyrus calleryana* |
| Pepper, Brazilian | *Schinus terebinthifolius* |
| Periwinkle | *Vinca major* |
| Periwinkle, Myrtle, dwarf | *Vinca minor* |
| Petunia spp. | *Petunia spp.* |
| Philodendron selloum | *Philodendron selloum* |
| Philodendron, "Micans" velvetleaf | *Philodendron oxycardium* |
| Photinia | *Photinia x fraseri* |
| Phyllostachys, Golden bamboo | *Phyllostachys aurea* |
| Physocarpus, Abbotswood | *Physocarpus fruticosa* |
| Physocarpus, Dwarf Ninebark, Nanus | *Physocarpus opulifolius* |
| Physocarpus, Gold drop | *Physocarpus fruticosa* |
| Physocarpus, Jackmanni | *Physocarpus fruticosa* |
| Pilea, Creeping Charlie | *Pilea nummulariifolia* |
| Pine, African fern | *Podocarpus gracilor* |
| Pine, Black / Austrian pine | *Pinus nigra* |
| Pine, Canary Island | *Pinus canariensis* |
| Pine, Dwarf Swiss mountain | *Pinus mugo* |
| Pine, Eastern white | *Pinus strobus* |
| Pine, Loblolly | *Pinus taeda** |

| COMMON NAME/VARIETY | SCIENTIFIC NAME |
|---|---|
| Pine, Longleaf | *Pinus palustris** |
| Pine, Mexican border | *Pinus strobiformus* |
| Pine, Norfolk Island | *Araucaria heterophylla* |
| Pine, Pitch | *Pinus rigids** |
| Pine, Pond | *Pinus serotina** |
| Pine, Red | *Pinus resinosa* |
| Pine, Sand | *Pinus clause** |
| Pine, Scotch | *Pinus sylvestris* |
| Pine, Shortleaf | *Pinus echinata** |
| Pine, Slash | *Pinus elliottii* |
| Pine, Spruce | *Pinus glabra** |
| Pine, Table-Mountain | *Pinus pungens** |
| Pine, Virginia | *Pinus virginiana* |
| Pine, Western / Ponderosa | *Pinus ponderosa* |
| Pine, Yew | *Podocarpus macrophylla* |
| Pink lady | *Raphiolepsis indica* |
| Plant, Candelabra | *Euphorbia lactea* |
| Plant, Caricature | *Graptophyllum pictum* |
| Plant, Mirror | *Coprosma baueri* |
| Plant, Ti | *Cordyline terminalis* |
| Plant, Variegated mirror | *Coprosma repens* |
| Plant, Waffle plant / metallic | *Hemigraphis spp.* |
| Plum, Natal | *Carissa grandiflora* |
| Plumbago, Cane | *Plumbrago capensis* |
| Plumosa | *Chamaecyparis pisifera* |
| Polystichum capense | *Polystichum capense* |
| Portulaca, Sunglo | *Portulaca grandiflora** |
| Potentilla, Gold drop, Primrose beauty | *Potentilla fructosa* |
| Potentilla verna | *Potentilla verna** |
| Protea | *Protea compacts** |
| Protea | *Protea eximia** |
| Protea | *Protea repens** |
| Protea, Giant / King | *Protea cynaroides* |
| Protea, Oleander-leaved | *Protea nerifolia** |
| Pygym, Crimson | *Berberis thunbergii** |
| Pyracanths, Lodense | *Pyracanths koidzumii* |
| Quince, Flowering | *Chaenomeles speciosa** |
| Radiator plant | *Peperomia scandens* |
| Rhododendron | *Rhododendron formosa* |
| Rhododendron, Amoenum | *Rhododendron obtusum* |
| Rhododendron, Blaauw's pink | *Rhododendron spp.* |
| Rhododendron, Boule de neige | *Rhododendron spp.* |
| Rhododendron, Chionoides | *Rhododendron catawbiense* |
| Rhododendron, Coral bells | *Rhododendron obtusum* |
| Rhododendron, Delaware Valley white | *Rhododendron spp.* |
| Rhododendron, Elizabeth Gable | *Rhododendron catawbiense* |
| Rhododendron, English roseum | *Rhododendron catawbiense* |

| COMMON NAME/VARIETY | SCIENTIFIC NAME |
|---|---|
| Rhododendron, Fashio | *Rhododendron spp.* |
| Rhododendron, Gerard's Rose | *Rhododendron spp.* |
| Rhododendron, Gibraltar | *Rhododendron spp.* |
| Rhododendron, Gloria | *Rhododendron spp.* |
| Rhododendron, Greeting | *Rhododendron spp.* |
| Rhododendron, Gumpo pink | *Rhododendron spp.* |
| Rhododendron, Gumpo white | *Rhododendron spp.* |
| Rhododendron, H. H. Hume | *Rhododendron spp.* |
| Rhododendron, Hahm red | *Rhododendron spp.* |
| Rhododendron, Herbert | *Rhododendron spp.* |
| Rhododendron, Hino red | *Rhododendron spp.* |
| Rhododendron, Kaempo | *Rhododendron spp.* |
| Rhododendron, Kluis sensation | *Rhododendron spp.* |
| Rhododendron, Korean azalea/Poukhanense | *Rhododendron yedoense* |
| Rhododendron, Less dark purple | *Rhododendron catawbiense* |
| Rhododendron, Masasoit | *Rhododendron spp.* |
| Rhododendron, Mother's Day | *Rhododendron spp.* |
| Rhododendron, Pericat | *Rhododendron spp.* |
| Rhododendron, Pink pearl | *Rhododendron spp.* |
| Rhododendron, President Lincoln | *Rhododendron spp.* |
| Rhododendron, Prize | *Rhododendron spp.* |
| Rhododendron, Purple elegans | *Rhododendron catawbiense* |
| Rhododendron, Purple gem | *Rhododendron spp.* |
| Rhododendron, Purple splendor | *Rhododendron catawbiense* |
| Rhododendron, Red ruffle | *Rhododendron spp.* |
| Rhododendron, Red wing | *Rhododendron spp.* |
| Rhododendron, Road runner | *Rhododendron spp.* |
| Rhododendron, Rose greeley | *Rhododendron catawbiense* |
| Rhododendron, Rosebud | *Rhododendron spp.* |
| Rhododendron, Roseum elegans | *Rhododendron catawbiense* |
| Rhododendron, Roseum superbum | *Rhododendron catawbiense* |
| Rhododendron, Royalty | *Rhododendron spp.* |
| Rhododendron, Rutherfordiana Constances | *Rhododendron spp.* |
| Rhododendron, Salmon spray | *Rhododendron spp.* |
| Rhododendron, Snow | *Rhododendron spp.* |
| Rhododendron, Stewartstonian | *Rhododendron spp.* |
| Rhododendron, Sweethart | *Rhododendron spp.* |
| Rhododendron, Tabor | *Rhododendron spp.* |
| Rhododendron, Tradition | *Rhododendron spp.* |
| Rhododendron, White cascade | *Rhododendron spp.* |
| Rhododendron, White catawba | *Rhododendron catawbiense* |
| Rhododendron "Gable Hybrid" | *Rhododendron* "Gable Hybrid" |
| Rhuellia californica | *Rhuellia californica* |
| Rose | *Rosa spp.* |
| Rose, Hybrid tea | *Rosa hybrida* |
| Rose, Rock | *Cistus hybridus* |
| Rosemary dwarf | *Rosmarinus officinalis prostratus* |
| Rubber tree | *Ficus elastica decora* |

| COMMON NAME/VARIETY | SCIENTIFIC NAME |
|---|---|
| Sage, Texas | *Leucophyllum frutescens* |
| Sally, Moneywort / Wandering | *Lysimachia nummularia* |
| Saltbush | *Atriplex spp.* |
| Salvia greggii | *Salvia greggi* |
| Sandwort | *Arenaria verna* |
| Sansevieria, Hahaii / Mother-in-law's tongue | *Sansevieria trifasciata* |
| Sansevieria, Moon Glow | *Sansevieria spp.* |
| Santolina, Lavendar cotton | *Santolina chanaecy parissus* |
| Schefflera, Manila Ripple | *Schefflera arboricola* |
| Schinus, California pepper | *Schinus molle* |
| Sedum | *Sedum spectabile* |
| Sedum, Brown bean | *Sedum quatemalense* |
| Sedum, Green stone crop | *Sedum brevifolium* |
| Sedum x rubrotinctum | *Sedum x rubrotinctum* |
| Snapdragon | *Antirrihinum majus**** |
| Snapdragon, Yellow floral carpet | *Antirrihinum majus* |
| Spirae, Anthony Waterer | *Spirae x bumalda* |
| Spirae, Billiard | *Spirae x billiardi* |
| Spirae, Coccinea | *Spirae japonica**** |
| Spirae, Crispa | *Spirae x bumalda* |
| Spirae, Froebelii | *Spirae x bumalda* |
| Spirae, Gold Flame | *Spirae x bumalda* |
| Spirae, Snowmound | *Spirae nipponica* |
| Spirae, Thunberg | *Spirae thunbergii* |
| Spirea, False | *Astilbe x arendsii* |
| Sprengeri | *Asparagus densiflorus* |
| Spruce, Blue | *Picea pungens* |
| Spruce, Dwarf Alberta, Black Hills, Densata | *Picea glauca* |
| Spruce, Norway | *Picea abies* |
| Spruce, Serbian | *Picea omarika* |
| Statice, Annual | *Statice sinuata* |
| Strawberry, Ornamental | *Fragaria chiloensis* |
| Sumac, fragrant | *Rhus aromatica* |
| Sumar, African standard | *Rhus lancea* |
| Sweetgum, American | *Liquidambar styraciflua* |
| Sycamore | *Platanus spp.**** |
| Tecoma, Yellow Bells | *Tecoma stans angustate* |
| Thuga, Berkman's | *Thuga orientalis* |
| Thuga, Emerald green | *Thuga occidentalis* |
| Thuga, Globosa | *Thuga occidentalis* |
| Thuga, Pyramidalis | *Thuga occidentalis* |
| Thuga, Techny | *Thuga occidentalis* |
| Thuga, Techny american arborvitae | *Thuga occidentalis* |
| Thuga, White Cedar | *Thuga occidentalis* |
| Thuga, Woodwardii | *Thuga occidentalis* |
| Trachelospermum asiaticum | *Trachelospermum asiaticum* |
| Tree, Firewheel | *Stenocarpus sinuatus* |

| COMMON NAME/VARIETY | SCIENTIFIC NAME |
|---|---|
| Tree, Golden-rain | *Koelreuteria paniculata**|
| Tree, New Zealand Christmas | *Metrosideros excelsus* |
| Tree, Pagoda | *Sophora japonica** |
| Tree, Varnish | *Koelreuteria panicalata* |
| Tree, Yellow oleander | *Thevetia peruvianaa* |
| Viburnum, Arrowwood | *Viburnum dentatum* |
| Viburnum, Compact cranberrybush | *Viburnum trilobum* |
| Viburnum, Doublefile / tomentosum | *Viburnum plicatum* |
| Viburnum, Japanese snowball | *Viburnum japonicum* |
| Viburnum, Judd | *Viburnum x juddi* |
| Viburnum, Nanum | *Viburnum opulus* |
| Viburnum, Spandankwa | *Viburnum suspensum* |
| Viburnum, Willowwood | *Viburnum x rhytidophylloides* |
| Weigelia, Newport red | *Weigelia florida* |
| Weigelia, Pink | *Weigelia florida* |
| Welleri | *Buxus sempervirens* |
| Willow, Australia | *Geijera parviflora* |
| Willow, Basket | *Salix purpurea* |
| Willow, Desert | *Pittosporum phillyraeoides* |
| Willow, Purple | *Salix purpurea** |
| Willow, Tortuosa corkscrew | *Salix matsudana* |
| Willow, Weeping | *Salix babylonia** |
| Willow, Wheelers dwarf, variegated | *Pittosporum Tobira* |
| Willow, White | *Salix alba* |
| Xylosma senticosa | *Xylosma senticosa* |
| Yarrow, Common | *Achilea milefolium* |
| Yarrow, Coronation gold, fernleaf | *Achilea filipendulina* |
| Yaupon, Dwarf yaupon / Tall | *Ilex vomitoria* |
| Yew, Dense | *Taxus x media* |
| Yew, Hicks | *Taxus x media* |
| Yew, Japanese | *Taxus cuspidata* |
| Yew, Thayeri | *Taxus x media* |
| Yucca | *Yucca filamentosa* |
| Yucca, Spanish dagger | *Yucca gloriosa* |
| Yucca, Weeping dagger | *Yucca pendula* |
| Zinnia spp. | *Zinnia spp.* |

*****Not applicable in California

**Table 2. Directed Applications.**

- When plant growth habit allows, applications should be made as a directed spray to the ornamental plants listed below to minimize phytotoxicity.
- Limited testing of the ornamental plants listed below has shown phytotoxicity of up to 20% when Fusilade II Turf and Ornamental Herbicide is applied over-the-top at label rates. (Phytotoxicity can occur whenever spray comes in contact with the foliage, even during directed sprays.)

| COMMON NAME/VARIETY | SCIENTIFIC NAME |
|---|---|
| Bamboo, Heavenly | *Nandina domestica* |
| Bottle-brush, Weeping | *Callistemon viminalis* |
| Bugle weed | *Ajuga variegata* |
| Cactus, Prickly pear | *Opuntia spp.* |
| Cats Claw, Yellow trumpet | *Begonia tweediana* |
| Ceonothus griseus | *Ceonothus griseus* |
| Cinquefoil, Spring | *Potentilla verna* |
| Columbine | *Aquilegia hybrida* |
| Cypress, Leyland | *Cupressocyparis leylandi* |
| Dracaena, Massangeana | *Dracaena fragans* |
| Dracaena, Tricolor | *Dracaena marginata* |
| Eureka | *Rhododendrum obtusum* |
| Fetterbush | *Leucothoe axillaris* |
| Fir, Fraser | *Abies fraser* |
| Gallery | *Gladiolus x hortulanus* |
| Gamolepsis chrysanthemoides | *Gamolepsis chrysanthemoides* |
| Gazania ringens | *Gazania ringens* |
| Grass, Green fountain | *Pennisetum sectaceum* |
| Grass, Mondo | *Ophiopogon japonicum* |
| Green carpet | *Herniaria glabra* |
| Guava, Pineapple | *Feijoa sellowiana* |
| Gum, Lemon-scented | *Eucalyptus citriodora* |
| Honesuckle, Japanese | *Lonicera japonica* |
| Indica | *Rhododendrum indicum* |
| Juniper, Arcadia | *Juniperus sabina* |
| Juniper, Blue Pacific | *Juniperus conferta* |
| Juniper, Blue Rug | *Juniperus horizontalis* |
| Juniper, Broadmoor | *Juniperus sabina* |
| Juniper, Grey Owl | *Juniperus virginiana* |
| Juniper, Hughes | *Juniperus horizontalis* |
| Juniper, Maney | *Juniperus chinensis* |
| Juniper, Nana | *Juniperus chinensis* |
| Juniper, Old Gold | *Juniperus chinensis* |
| Juniper, Pathfinder | *Juniperus scopulorum* |
| Juniper, Pfitzeriana | *Juniperus chinensis* |
| Juniper, Prostrata | *Juniperus chinensis* |
| Juniper, Robdsta | *Juniperus chinensis* |
| Juniper, San Jose | *Juniperus japonica* |
| Juniper, Scandia | *Juniperus sabina* |
| Juniper, Skyrocket | *Juniperus virginiana* |
| Juniper, Spearmint | *Juniperus chinensis* |
| Juniper, Tamariseifolia | *Juniperus sabina* |
| Juniper, Variegata | *Juniperus horizontalis* |

| COMMON NAME/VARIETY | SCIENTIFIC NAME |
|---|---|
| Juniper, Webberi | *Juniperus horizontalis* |
| Juniper, Welchii | *Juniperus scopulorum* |
| Juniper, Wiltonii | *Juniperus horizontalis* |
| Juniper, Youngtown Compacta | *Juniperus horizontalis* |
| Kurume | *Rhododendrum obtusum* |
| Lantana, White | *Lantana montevidensis x* |
| Lilac | *Syringa chinensis* |
| Maki | *Podocarpus macrophyllus* |
| Maple, Red | *Acer rubrum* |
| Oleander | *Nerium oleander standard* |
| Oyster plant | *Rhoeo spathacea* |
| P.I.M. | *Rhododendrum spp.* |
| Philodendrum spp. | *Philodendrum spp.* |
| Plumeria, Temple Tree | *Plumeria acuminata* |
| Privet, Japanese | *Ligustrum japonicum* |
| Protea | *Banksia prinotes**  |
| Protea | *Banksia victoria** |
| Protea | *Banksia speciosa** |
| Protea, Pincushion | *Leucospermum cordifolium** |
| Ruelia | *Ruelia ciliosa* |
| Snowball, Chinese | *Viburnum macrocephalum* |
| Spirea, Vanhoutte | *Spirea x vanhouteii* |
| Star plant, Lavender | *Grewia caffra* |
| Sunglow | *Rhododendrum obtusum* |
| Tree, Strawberry | *Arbustus unedo* |
| Varigated ajuga | *Ajuga reptans* |
| Willow | *Salix caroliniana* |

*****Not applicable in California

**Table 3. Directed Applications.**

- When plant growth habit allows, applications should be made as a directed spray to the ornamental plants listed below to minimize phytotoxicity.
- Limited testing of the ornamental plants listed below has shown phytotoxicity of up to 50% when Fusilade II Turf and Ornamental Herbicide is applied over-the-top at label rates. (Phytotoxicity can occur whenever spray comes in contact with the foliage, even during directed sprays).

| COMMON NAME/VARIETY | SCIENTIFIC NAME |
|---|---|
| Acacia | *Acacia latifolia* |
| Acacia sweet | *Acacia farnesiana* |
| Bleeding heart | *Dicentra spectabilis* |
| Blueberry tifblue | *Vaccinum achei* |
| Bottle tree | *Brachychiton populneum* |
| Carrot wood | *Cupaniopsis anacardioides* |
| Cassia | *Cassia condolioma* |
| Cherry mazzard | *Avium* prunum* |
| Cordyline | *Cordyline stricta* |
| Coromandel | *Asystasia gangetica* |
| Croton chinese crenate | *Exococaria cochichinensis* |
| Desert broom | *Baccharis sarothorides* |
| Eucalyptus | *Eucalyptus nicholii* |
| Fiddlewood | *Citharexylum spinosum* |
| Hearts and flowers | *Aptenia cordifolia* |
| Hibiscus | *Hibiscus lepenk* |
| Ice plant white (trailing) | *Mesembryanthemum delosperma alba* |
| Ivy swedish | *Plectranthus australis* |
| Jade plant | *Crassula argentea* |
| Janet Craig/Warnecki | *Dracaena deremensis* |
| Juniper, Armstrongii | *Juniperus chinensis* |
| Juniper, Burkii | *Juniperus virginiana* |
| Juniper, Excelsa Strieta | *Juniperus scopulorum* |
| Juniper, Spiny Greek | *Juniperus scopulorum* |
| Justicia red | *Odontonema strictum* |
| Kings crown | *Justicia carnea* |
| Knotweed pinkhead | *Polygonum capitatum* |
| Magnolia southern | *Magnolia gradiflora* |
| Pothos/Marble Queen | *Epipremnum aureum* |
| Primrose, mexican evening | *Oenothera berlandier* |
| Rhododendron, Formosa | *Rhododendron indicum* |
| Rhododendron, Hersey red | *Rhododendron obtusum* |
| Rhododendron, Hino pink | |
| Rhododendron, Hinodegeri | |
| Rhododendron, Karen | *Rhododendron poukhanensis* |
| Rubber plant baby | *Peperomia obtusifolia* |
| Shrimp plant | *Justicia brandegeana* |
| Shrimp plant yellow | *Pachystachys lutea* |
| Slipper flower | *Pedilanthus tithymaloides* |
| Sonoran palo verde | *Cercidium praecox* |
| Thunbergia laurel-leaved | *Thunbergia laurifloia* |
| Umbrella plant | *Cyperus alternifolius* |
| White shrimp plant | *Justicia betonia* |

*****Not applicable in California

**Table 4. Directed Applications.**

- When plant growth habit allows, applications should be made as a directed spray to the ornamental plants listed below to minimize phytotoxicity.
- Limited testing of the ornamental plants listed below has shown phytotoxicity greater than 50% when Fusilade II Turf and Ornamental Herbicide is applied over-the-top at label rates. (Phytotoxicity can occur whenever spray comes in contact with the foliage, even during directed sprays.)

| COMMON NAME/VARIETY | SCIENTIFIC NAME |
|---|---|
| Birch river | *Alsophia australis* |
| Chandelier plant | *Kalanchoe tubiflora* |
| Compacta | *Euonymus alata* |
| Falsecypress boulevard | *Chamaecyparis pisifera* |
| Fern australia tree | *Acalypha godsefeiana hertophylla* |
| Grass pampas | *Coprtederia selloana* |
| Juniper, Bar Harbor | *Juniperus spp.* |
| Juniper, Blue chip | *Juniperus horizontalis* |
| Juniper, Blue Haven | *Juniperus scopulorum* |
| Juniper, Prince of Wales | *Juniperus spp.* |
| Juniper, Sea green | *Juniperus chinensis* |
| Katherine Dykes | *Physocarps fruticosa* |
| Lavender-scallops | *Kalanchoe fedtschenkoi* |
| Periwinkle madagascar | *Catharanthus roseus* |
| Purple heart | *Setcreasea purpurea* |
| Spider plant | *Chlorophytum comosum* |
| Wandering jew | *Zebrina pendula* |

## NONCROP AREAS ROADSIDE, INDUSTRIAL AND OTHER AREAS

Fusilade II Turf and Ornamental Herbicide can be used to control annual and perennial grass weeds in noncrop areas. Noncrop areas include airports, cemeteries, electric transformer stations and substations, pipeline pumping stations, around buildings, storage yards, fence lines, parkways, roadsides, rights-of-way, and similar noncropland areas. See Tables 1-4 for specific recommended uses.

Fusilade II Turf and Ornamental Herbicide can be used to control annual and perennial grass weeds in many newly transplanted and established nongrassy ornamentals, trees, shrubs and ground covers. See Tables 1-4 for specific recommended uses.

Fusilade II Turf and Ornamental Herbicide may also be used to suppress and eventually control some undesirable grasses in turf areas of golf courses and residential, commercial, public and industrial buildings.

## SPOT TREATMENTS AND DIRECTED SPRAYS (NOT FOR USE ON DESIRABLE TURF)

Mix Fusilade II Turf and Ornamental Herbicide and a nonionic surfactant with water according to the amounts shown below. Spray to obtain thorough coverage, but do not spray to runoff. Retreat if necessary.

### SPOT SPRAY RECOMMENDATIONS

| To Make This Spray Volume | Add These Amounts | |
|---|---|---|
| | Fusilade II Turf and Ornamental Herbicide | Nonionic Surfactant |
| 1 gal. | 0.75 fl. oz. | 1/2 fl. oz. |
| 10 gals. | 6.5 fl. oz. | 3 fl. oz |
| 25 gals. | 1 pt. | 1/2 pt. |
| 50 gals. | 1 qt. | 1 pt. |

## GENERAL PRECAUTIONS

- FOR USE ONLY BY COMMERCIAL OR LICENSED APPLICATORS WHEN APPLICATIONS ARE TO BE MADE IN OR AROUND HOMES.
- Do not store Fusilade II Turf and Ornamental Herbicide in or around homes.

## WEED CONTROL IN DESIRABLE TURFGRASS

For the suppression and/or control of Common Bermudagrass, Hybrid Bermudagrass and other grass weeds in Zoysia and Tall Fescue. Not for use on home lawns.

Keep off fescue in summer.

Apply 0.07-0.14 oz/1000 sq. ft. (3-6 oz./A) along with 0.25% v/v (1/2 pt./25 gals.) of a nonionic surfactant. Application should be made every 28 days when the grass weeds are actively growing. The higher rates may result in temporary discolorization of the desirable turf with recovery in 10-14 days. **Do not apply to desirable turf which is under stress.** For best results, make applications in spring and fall and avoid treatments during July and August.

Complete control of undesirable grass may take 1-2 growing seasons.

**Over-spray Zoysia:** Application should be made at a rate of 3-4 oz./A with Fusilade II Turf and Ornamental Herbicide, and a nonionic surfactant. Applications should be made in late spring (around June 1) and repeated about every 28-30 days. Late-summer application can be reduced to 2-3 oz./A as bermudagrass is preparing for dormancy. During hot summer weather the rates could be increased to 4-5 oz./A. **Note:** The 5 oz. rate could cause temporary turf discoloration.

**Over-spray Tall Fescue:** Application rate should be 5-6 oz./A. Application should be made during warm weather in early spring (April, May) when bermudagrass is breaking dormancy. This should be repeated in fall (September/October) when bermudagrass is preparing for dormancy. Applications during the hot months of summer should be avoided. **Note:** This application will show slight discoloration to desirable turfgrass. Desirable grasses should recover within 10-14 days. Weather and cultural treatments can also effect applications. Use a minimum of 30 gallons of water per acre.

## TANK MIX RECOMMENDATIONS NON-CROP AREAS – WEED CONTROL

### Fusilade II Turf & Ornamental Herbicide with Reward® Landscape and Aquatic or Reward® LS Landscape Herbicide

Fusilade II Herbicide and Reward herbicides may be applied together in a tank mix program for desiccation plus systemic control of grassy weeds.

Apply 16-24 oz. Fusilade II Herbicide with 16-32 oz. Reward Landscape and Aquatic or Reward LS Landscape Herbicides per acre. Add 8-16 oz. of a 75% or greater nonionic surfactant per 100 gallons of water.

### Tank Mix Precautions – Fusilade II and Reward Landscape and Aquatic or Reward LS Landscape Herbicides

Use the full label rate of Fusilade II Herbicide.

Always add 8-16 oz. of a 75% or greater nonionic surfactant per 100 gallons of water.

Due to the very fast desiccation of photosynthesizing plant tissue, Reward herbicides may cause some antagonism of the activity of Fusilade II Herbicide, which must be translocated to cause its effect.

Application in the evening, at night, or under cloudy conditions will enhance translocation of Fusilade II Herbicide and increase systemic control.

**Annual and Perennial Grasses Controlled by Fusilade II Turf and Ornamental Herbicide**

| COMMON NAME | SCIENTIFIC NAME | GROWTH STAGE (INCHES) |
|---|---|---|
| Barnyardgrass | *Echinochloa crus-galli* | 2-8 |
| Bermudagrass | *Cynodon dactylon* | 4-8 |
| Broadleaf signalgrass | *Brachiaria platyphylla* | 2-8 |
| Crabgrass, Large | *Digitaria sanguinalis* | 2-8 |
| Crabgrass, Smooth | *Digitaria ischaemum* | 2-8 |
| Crabgrass, Southern | *Digitaria ciliaris* | 2-8 |
| Crabgrass, Tropical | *Digitaria bicornis* | 2-8 |
| Downy brome | *Bromus tectorum* | 2-8 |
| Fall Panicum | *Panicum dichotomiflorum* | 2-8 |
| Field Sandbur | *Cenchrus incertus* | 2-8 |
| Foxtail, Giant | *Setaria faberi* | 2-8 |
| Foxtail, Green | *Setaria viridis* | 2-8 |
| Foxtail, Yellow | *Setaria lutescens* | 2-8 |
| Goosegrass | *Eleusine indica* | 2-8 |
| Guineagrass, seedling | *Panicum maximum* | 6-12 |
| Italian Ryegrass | *Lolium multiflorum* | 2-8 |

| COMMON NAME | SCIENTIFIC NAME | GROWTH STAGE (INCHES) |
|---|---|---|
| Itchgrass | *Rottboellia exaltata* | 2-8 |
| Johnsongrass, Rhizome | *Sorghum halepense* | 8-18 |
| Johnsongrass, Seedling | *Sorghum halepense* | 8-18 |
| Junglerice | *Echinochloa colonum* | 2-8 |
| Kikuyugrass* | *Pennisetum clandestinum* | 4-8 |
| Prairie cupgrass | *Eriochloa contracta* | 2-8 |
| Quackgrass | *Agropyron repens* | 6-10 |
| Rabbitfootgrass | *Polypogon monspeliensis* | 2-8 |
| Red Rice | *Oryza sativa* | 2-8 |
| Shattercane | *Sorghum bicolor* | 2-8 |
| Sorghum almum | *Sorghum almum* | 2-8 |
| Southern Sandbur | *Cenchrus echinatus* | 2-8 |
| Southwestern cupgrass | *Eriochloa gracilis* | 2-8 |
| Texas Panicum | *Panicum texanum* | 2-8 |
| Torpedograss** | *Panicum repens* | 3-10 |
| Volunteer Cereals | | |
| V. Barley | *Hordeum vulgare* | 2-8 |
| V. Corn | *Zea mays* | 2-8 |
| V. Milo | *Sorghum bicolor* | 2-8 |
| V. Oats | *Avena sativa* | 2-8 |
| V. Rye | *Secale cereals* | 2-8 |
| V. Wheat | *Triticum aestivum* | 2-8 |
| Wild Proso Millet | *Panicum miliaceum* | 2-8 |
| Witchgrass | *Panicum capillare* | 2-8 |
| Wild oats | *Avena fatua* | 2-8 |
| Wirestem muhly | *Muhlenbergia frondosa* | 4-12 |
| Witchgrass | *Panicum capillare* | 2-8 |
| Woolly cupgrass | *Eriochloa villosa* | 2-8 |

Note: For best results, apply before tillering and/or herding.

*Not for use in California

**Use 24 oz./A per application up to three applications may be needed for complete control.

**CONVERSION TABLE**
**Fusilade II Turf and Ornamental Herbicide Rate to be Applied**

| Lb. a.i./Acre | Pts./Acre | Fl. Oz./Acre | Acres/Gal. |
|---|---|---|---|
| 0.047 | 3/16 | 3 | 42.7 |
| 0.063 | 1/4 | 4 | 32.0 |
| 0.078 | 5/16 | 5 | 25.6 |
| 0.094 | 3/8 | 6 | 21.3 |
| 0.125 | 1/2 | 8 | 16.0 |
| 0.156 | 5/8 | 10 | 12.8 |
| 0.188 | 3/4 | 12 | 10.7 |
| 0.250 | 1 | 16 | 8.0 |
| 0.375 | 1 1/2 | 24 | 5.3 |



For non-emergency (e.g., current product information) call
Syngenta Crop Protection at 1-800-334-9481

Syngenta Crop Protection, Inc.
Greensboro, North Carolina 27409
www.syngenta-us.com

**SCP 1084A-L1A 1203**

FUSILADE® II

## Turf and Ornamental Herbicide

For the control of grass weeds in landscape areas, roadsides, nurseries, greenhouses, flower beds, groundcovers, interiorscapes, parks, sports fields, golf courses, commercial and residential areas.

| Active Ingredient: | |
|---|---|
| Fluazifop-P-butyl | |
| Butyl (*R*)-2-[4-[[5-(trifluoromethyl)-2-pyridinyl]oxy] phenoxy]propanoate* | 24.5% |
| Other Ingredients: | 75.5% |
| Total: | 100.0% |

*Fusilade II Turf and Ornamental Herbicide contains 2 pounds (+) isomer (fluazifop-P-butyl) per gallon.

Contains petroleum hydrocarbons.

EPA Reg. No. 100-1084

EPA Est. 11773-IA-01$^{VWC}$

EPA Est. 46073-TN-003$^{NTM}$

(Superscript is first three letters of batch code on container.)

**KEEP OUT OF REACH OF CHILDREN.**

## CAUTION

See directions for use in attached booklet.

**AGRICULTURAL USE REQUIREMENTS**

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. Refer to supplemental labeling under "Agricultural Use Requirements" in the Directions for Use section for information about this standard.

**SCP 1084A-L1A 1203**

**1 quart**
**Net Contents**

syngenta

## KEEP OUT OF REACH OF CHILDREN.

# CAUTION

### Precautionary Statements

**Hazards to Humans and Domestic Animals**

**CAUTION**

Harmful if absorbed through skin or inhaled. Causes eye irritation. Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals. Avoid contact with skin, eyes or clothing. Avoid breathing vapor or spray mist.

### FIRST AID

**If on skin or clothing:** Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.

**If inhaled:** Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a poison control center or doctor for further treatment advice.

**If in eyes:** Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.

**If swallowed:** Call a poison control center or doctor immediately for treatment advice. Do not give any liquid to the person. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give anything by mouth to an unconscious person.

Have the product container or label with you when calling a poison control center or doctor or going for treatment.

**HOT LINE NUMBER:** For 24 Hour Medical Emergency Assistance (Human or Animal) Or Chemical Emergency Assistance (Spill, Leak, Fire or Accident) Call **1-800-888-8372.**

### Environmental Hazards

This product is toxic to fish. Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment washwaters. Do not apply when weather conditions favor drift from target area.

### Physical or Chemical Hazards

Do not use or store near heat or open flame.

### Container Disposal

Triple-rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, by incineration or, if allowed by state and local authorities, by burning. If burned stay out of smoke.

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Product of United Kingdom
Formulated in the USA



Syngenta Crop Protection, Inc.
Greensboro, North Carolina 27409
www.syngenta-us.com

**SCP 1084A-L2A 1203**

# MATERIAL SAFETY DATA SHEET

**Syngenta Crop Protection, Inc.**
**Post Office Box 18300**
**Greensboro, NC 27419**

**In Case of Emergency, Call**
**1-800-888-8372**

## 1. PRODUCT IDENTIFICATION

Product Name: **FUSILADE II TURF & ORNAMENTAL** Product No.: A12460A

EPA Signal Word: Caution

Active Ingredient(%): Fluazifop-P-Butyl Technical (24.5%) CAS No.: 79241-46-6

Chemical Name: Butyl(RS)-2-[4-[[5-(trifluoromethyl)-2-pyridinyl]oxy]phenoxy]propanoate

Chemical Class: A post emergence herbicide

EPA Registration Number(s): 100-1084 **Section(s) Revised: 2, 3, 4, 5, 6, 8, 15**

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

| Material | OSHA PEL | ACGIH TLV | Other | NTP/IARC/OSHA Carcinogen |
|---|---|---|---|---|
| Naphthalene (<= 3.9%) | 10 ppm TWA | 10 ppm TWA (skin) | 10 ppm TWA** | See "Toxicity", Sec. 11 |
| Petroleum distillates, light paraffinic | Not Established | Not Established | Not Established | No |
| Petroleum Solvent | Not Established | Not Established | 100 mg/m³ (15 ppm) TWA * | No |
| Fluazifop-P-Butyl Technical (24.5%) | Not Established | Not Established | 0.5 mg/m³ TWA*** | No |

* recommended by manufacturer

** recommended by NIOSH

*** Syngenta Occupational Exposure Limit (OEL)

Ingredients not precisely identified are proprietary or non-hazardous. Values are not product specifications.

## 3. HAZARDS IDENTIFICATION

Symptoms of Acute Exposure

Can cause eye, skin and respiratory passage irritation. Allergic reactions are possible. Harmful if inhaled or swallowed. Exposure to high vapor levels may cause headache, dizziness, numbness, nausea, incoordination, or other central nervous system effects.

Hazardous Decomposition Products

Can decompose at high temperatures forming toxic gases.

Physical Properties

Appearance: Dark brown liquid, free of sediment

Odor: Aromatic

Unusual Fire, Explosion and Reactivity Hazards

During a fire, irritating and possibly toxic gases may be generated by thermal decomposition or combustion.

## 4. FIRST AID MEASURES

Have the product container, label or Material Safety Data Sheet with you when calling Syngenta (800-888-8372), a poison contol center or doctor, or going for treatment.

Ingestion: If swallowed: Call Syngenta (800-888-8372), a poison control center or doctor immediately for treatment advice. Do not give any liquid to the person. Do not induce vomiting unless told to do so after calling 800-888-8372 or by a poison control center or doctor. Do not give anything by mouth to an unconscious person.

Eye Contact: If in eyes: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after 5 minutes, then continue rinsing eye. Call Syngenta (800-888-8372), a poison control center or doctor for treatment advice.

Skin Contact: If on skin or clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call Syngenta (800-888-8372), a poison control center or doctor for treatment advice.

Inhalation: If inhaled: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call Syngenta (800-888-8372), a poison control center or doctor for further treatment advice.

Notes to Physician

There is no specific antidote if this product is ingested.

Treat symptomatically.

Contains petroleum distillate - vomiting may cause aspiration pneumonia.

Medical Condition Likely to be Aggravated by Exposure

None known.

## 5. FIRE FIGHTING MEASURES

Fire and Explosion

| | | |
|---|---|---|
| Flash Point (Test Method): | > 212°F (TCC) | |
| Flammable Limits (% in Air): | Lower: % Not Applicable | Upper: % Not Applicable |
| Autoignition Temperature: | Not Available | |
| Flammability: | Not Applicable | |

Unusual Fire, Explosion and Reactivity Hazards

During a fire, irritating and possibly toxic gases may be generated by thermal decomposition or combustion.

In Case of Fire

Use dry chemical, foam or CO2 extinguishing media. Wear full protective clothing and self-contained breathing apparatus. Evacuate nonessential personnel from the area to prevent human exposure to fire, smoke, fumes or products of combustion. Prevent use of contaminated buildings, area, and equipment until decontaminated. Water runoff can cause environmental damage. If water is used to fight fire, dike and collect runoff.

## 6. ACCIDENTAL RELEASE MEASURES

In Case of Spill or Leak

Control the spill at its source. Contain the spill to prevent from spreading or contaminating soil or from entering sewage and drainage systems or any body of water. Clean up spills immediately, observing precautions in Protective Equipment Section. Cover entire spill with absorbing material and place into compatible disposal container. Scrub area with hard water detergent (e.g. commercial products such as Tide, Joy, Spic and Span). Pick up wash liquid with additional absorbent and place into compatible disposal container. Once all material is cleaned up and placed in a disposal container, seal container and arrange for disposition.

## 7. HANDLING AND STORAGE

Store the material in a well-ventilated, secure area out of reach of children and domestic animals. Do not store food, beverages or tobacco products in the storage area. Prevent eating, drinking, tobacco use, and cosmetic application in areas where there is a potential for exposure to the material. Wash thoroughly with soap and water after handling.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**THE FOLLOWING RECOMMENDATIONS FOR EXPOSURE CONTROLS/PERSONAL PROTECTION ARE INTENDED FOR THE MANUFACTURE, FORMULATION, PACKAGING AND USE OF THIS PRODUCT.**

**FOR COMMERCIAL APPLICATIONS AND/OR ON-FARM APPLICATIONS CONSULT THE PRODUCT LABEL.**

Ingestion: Prevent eating, drinking, tobacco usage and cosmetic application in areas where there is a potential for

exposure to the material. Wash thoroughly with soap and water after handling.

Eye Contact: Where eye contact is likely, use chemical splash goggles.

Skin Contact: Where contact is likely, wear chemical-resistant (such as nitrile or butyl) gloves, coveralls, socks and chemical-resistant footwear. For overhead exposure, wear chemical-resistant headgear.

Inhalation: Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below exposure limits. A NIOSH-certified combination air-purifying respirator with an N, P or R 95 or HE class filter and an organic vapor cartridge may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a pressure demand atmosphere-supplying respirator if there is any potential for uncontrolled release, exposure levels are not known, or under any other circumstances where air-purifying respirators may not provide adequate protection.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|---|
| Appearance: | Dark brown liquid, free of sediment |
| Odor: | Aromatic |
| Melting Point: | Not Applicable |
| Boiling Point: | Not Available |
| Specific Gravity/Density: | 0.98 g/ml @ 68°F (20°C) |
| pH: | 6.2 (1% w/w dilution in deionized water) |

Solubility in H2O

Fluazifop-P-Butyl Technical: Almost insoluble in water (1 mg/l @ pH 5 - 6.5)

Vapor Pressure

Fluazifop-P-Butyl Technical: 4.5 x 10(-7) mmHg @ 68°F (20°C)

## 10. STABILITY AND REACTIVITY

| | |
|---|---|
| Stability: | Stable under normal use and storage conditions. |
| Hazardous Polymerization: | Will not occur. |
| Conditions to Avoid: | None known. |
| Materials to Avoid: | Oxidizing agents. |
| Hazardous Decomposition Products: | Can decompose at high temperatures forming toxic gases. |

## 11. TOXICOLOGICAL INFORMATION

Acute Toxicity/Irritation Studies (Finished Product)

| | | |
|---|---|---|
| Ingestion: | Practically Non-Toxic | |
| | Oral (LD50 Rat) : | > 5,000 mg/kg body weight |
| Dermal: | Practically Non-Toxic | |
| | Dermal (LD50 Rat) : | > 2,000 mg/kg body weight |
| Inhalation: | Slightly Toxic | |
| | Inhalation (LC50 Animal Not Available) : | 0.54 mg/l air - 4 hours |
| Eye Contact: | Slightly Irritating (Rabbit) | |
| Skin Contact: | Moderately Irritating (Rabbit) | |
| Skin Sensitization: | See "Other Toxicity Information", Sec. 11 | |

Reproductive/Developmental Effects

Fluazifop-P-Butyl Technical: In a 3-generation reproductive study in rats, effects included reductions in weight gain, fetal weight, ossification, testicular weight, spleen weight, increased prostate weight and gestation length. No Effect Level (NEL) was 1 mg/kg/day. Fetotoxic effects seen in the rabbit, including reduced fetal weight and reduced ossification at higher doses. No Effect Level (NEL) was 30 mg/kg/day in rabbits. The NEL for teratogenic effects is at least 10/mg/day in the rat, with

diaphragmatic hernia at higher doses. Not teratogenic at highest dose tested in rabbits (90 mg/kg/day). While fluazifop-p-butyl is fetotoxic when fed to pregnant rats, human exposure data has concluded that female formulation workers are not at increased risk of fetotoxic effects when skin protection measures are applied.

Chronic/Subchronic Toxicity Studies

Fluazifop-P-Butyl Technical: Chronic toxicity studies in rodents have shown liver changes (cellular hypertrophy). The No Effect Level (NEL) in rats is 10 ppm (0.5 mg/kg/day). Long term feeding studies in dogs produced a range of potentially serious effects at high dose rates (red cell, bone marrow and lymphadenopathy changes and liver and spleen damage) with a No Effect Level of 25 mg/kg/day.
No specific neurotoxicity tests have been conducted on fluazifop-p-butyl. However, there was no evidence of neurotoxicity in acute, subchronic or chronic studies.

Carcinogenicity

Fluazifop-P-Butyl Technical: Laboratory studies show no evidence that fluazifop-p-butyl is a carcinogen. Specific rat and mouse lifetime studies on fluazifop butyl (a related compound) showed no carcinogenic effects (highest doses 250 ppm rat and 80 ppm mouse).

Other Toxicity Information

Repeated and/or prolonged contact may cause skin sensitization.

Toxicity of Other Components

Naphthalene (<= 3.9%)

Exposure to naphthalene can cause cataracts, liver damage, kidney failure, respiratory failure, hematuria, anemia, damage to red blood cells, leukocytosis, or coma.
Carcinogen Status:
NTP: Anticipated Carcinogen
IARC: Group 2B Possible Human Carcinogen

Petroleum Solvent

Inhalation of vapors at high concentrations can cause central nervous system effects (dizziness, headache), irritation to eyes or respiratory tract.

Petroleum distillates, light paraffinic

May cause respiratory tract irritation. Harmful if swallowed. Pulmonary aspiration hazard.

Target Organs

Active Ingredients

| | |
|---|---|
| Fluazifop-P-Butyl Technical: | Liver, skin, kidney, eye, bone marrow, blood, reproductive system |

Inert Ingredients

| | |
|---|---|
| Naphthalene: | Eye, liver, kidney, respiratory tract, blood, CNS |
| Petroleum Solvent: | Respiratory tract, stomach, liver, thyroid, urinary bladder, CNS, skin |
| Petroleum distillates, light paraffinic: | Respiratory tract |

## 12. ECOLOGICAL INFORMATION

Summary of Effects

Fluazifop-P-Butyl Technical:

Toxic to fish and invertebrates. Slightly toxic to birds. Practically non-toxic to bees.

Eco-Acute Toxicity

Fluazifop-P-Butyl Technical:

Bees LC50/EC50 > 200 ug/bee
Invertebrates (Water Flea) LC50/EC50 1.0 ppm
Fish (Trout) LC50/EC50 1.4 ppm
Fish (Bluegill) LC50/EC50 0.53 ppm
Birds (8-day dietary - Bobwhite Quail) LC50/EC50 > 4,659 ppm

Birds (8-day dietary - Mallard Duck) LC50/EC50 4,321 ppm

Eco-Chronic Toxicity

Fluazifop-P-Butyl Technical: Not Available

Environmental Fate

Fluazifop-P-Butyl Technical:

No data available for the formulation. The information presented here is for the active ingredient, fluazifop-p-butyl. Not persistent in soil or water. Immobile in soil. Sinks in water (after 24 h).

## 13. DISPOSAL CONSIDERATIONS

Disposal

Do not reuse product containers. Dispose of product containers, waste containers, and residues according to local, state, and federal health and environmental regulations.

Characteristic Waste: Not Applicable

Listed Waste: Not Applicable

## 14. TRANSPORT INFORMATION

DOT Classification

Not regulated by DOT.

B/L Freight Classification

Herbicides, NOIBN

Comments

None.

## 15. REGULATORY INFORMATION

EPCRA SARA Title III Classification

Section 311/312 Hazard Classes: Acute Health Hazard
Chronic Health Hazard

Section 313 Toxic Chemicals: Naphthalene (<= 3.9%) (CAS No. 91-20-3)

California Proposition 65

Not Applicable

CERCLA/SARA 302 Reportable Quantity (RQ)

Report product spills > 305 gal. (based on naphthalene [RQ = 100 lbs.] content in the formulation)

RCRA Hazardous Waste Classification (40 CFR 261)

Not Applicable

TSCA Status

Exempt from TSCA, subject to FIFRA

## 16. OTHER INFORMATION

| NFPA Hazard Ratings | | HMIS Hazard Ratings | |
|---|---|---|---|
| Health: | 2 | Health: | 2 |
| Flammability: | 1 | Flammability: | 1 |
| Instability: | 0 | Reactivity: | 0 |

| | |
|---|---|
| 0 | Minimal |
| 1 | Slight |
| 2 | Moderate |
| 3 | Serious |
| 4 | Extreme |

For non-emergency questions about this product call:

1-800-334-9481

The information and recommendations contained herein are based upon data believed to be correct. However, no guarantee or warranty of any kind, expressed or implied, is made with respect to the information contained herein.

RSVP# : SCP-955-00333B

End of MSDS

Dow AgroSciences™

# Garlon* 4

## Herbicide

For the control of undesirable woody plants and annual and perennial broadleaved weeds on pastures and rangelands, and in non-crop areas such as rights-of-way, military bases and industrial sites.

COMMERCIAL

READ THE LABEL AND BOOKLET BEFORE USING
KEEP OUT OF REACH OF CHILDREN

GUARANTEE: triclopyr 480g acid equivalent/L
(present as butoxyethyl ester)

REGISTRATION NO. 21053 PEST CONTROL PRODUCTS ACT

**CAUTION**  **POISON**

**POTENTIAL SKIN SENSITIZER**

NET CONTENTS: 2 x 10 L, 110 L returnable container

**Dow AgroSciences Canada Inc.**
Suite 201, 1144 - 29 Avenue N.E.
Calgary, Alberta
T2E 7P1
1-800-667-3852

**OPERATOR USE PRECAUTIONS**
**HARMFUL IF SWALLOWED**
**MAY CAUSE SKIN IRRITATION**
**MAY BE HARMFUL IF ABSORBED THROUGH SKIN**
**POTENTIAL SKIN SENSITIZER**
**KEEP OUT OF REACH OF CHILDREN**

Avoid contact with eyes, skin and clothing. Wash thoroughly after handling. Avoid breathing vapour or spray mist. Where frequent inhalation of spray mist cannot be avoided, occupational exposure to pesticides can be reduced by use of an air-purifying respirator equipped with organic vapour cartridges. Avoid contact with treated foliage and other contaminated surfaces while wet. When spraying, follow a "walk in, spray out" pattern to avoid contact with treated brush. Take precautions to avoid spray drift. Direct spray outward and away from self. Avoid overhead spraying. Select spray nozzle types and pressures to minimize drift potential.

Practice good personal hygiene. At all times when handling herbicide concentrate or applying the dilute mixture, plan events in such a way as to minimize personal exposure. Locate wash stations with an adequate supply of fresh water on work vehicles. Wash thoroughly with soap and water after handling and before eating or smoking. Bathe or take a hot shower after work using plenty of soap.

**To minimize exposure when handling and applying Garlon 4 herbicide:**

- Read and follow directions in the Protective Equipment Requirements and Operator Use Precautions sections on the label.
- Applicators should receive training on how to minimize personal exposure while applying high volume stem-foliage applied herbicides, including the "walk in, spray out" technique and on how to minimize contact with treated foliage.
- Applicators should be supervised to ensure that all label directions and proper application techniques are followed.

**PROTECTIVE EQUIPMENT REQUIREMENTS**
**Handling Concentrate**
When handling concentrate, wear goggles or faceshield, chemical resistant gloves (nitrile or neoprene), clean coveralls over normal work clothes, impermeable head covering and chemical resistant boots (rubber) during all mixing/loading activities. Remove clothing contaminated with concentrate promptly and wash before reuse. Exercise care in removal of contaminated clothing to avoid secondary skin contact. Segregate contaminated articles and launder separately from other clothing using a double rinse. Leather articles such as boots, belts or watchbands should be destroyed if contaminated by concentrate.

**Applying Dilute Spray Solution**
When spraying dilute solution and during equipment maintenance and repair, wear clean coveralls over normal working clothes, impermeable head covering, chemical resistant gloves (nitrile or neoprene) and chemical resistant footwear such as rubber boots.

**PHYSICAL OR CHEMICAL HAZARDS**
**COMBUSTIBLE**. Do not use or store near heat or open flame.

**FIRST AID**
**Take container, label or product name and Pest Control Product Registration Number with you when seeking medical attention.**
**If swallowed**: Do not induce vomiting. Call a physician and/or transport to emergency facility **IMMEDIATELY** or contact a poison control centre **IMMEDIATELY**.
**If in eyes**: Irrigate immediately with flowing water for fifteen minutes.
**If inhaled**: Remove to fresh air if effects occur. Consult a physician or a poison control centre **IMMEDIATELY**.
**If on skin**: Wash off in flowing water or shower.

**TOXICOLOGICAL INFORMATION**
The decision of whether to induce vomiting or not should be made by an attending physician. If lavage is performed, suggest endotracheal and/or esophageal control. Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach. **This product contains petroleum distillates.** No specific antidote. Employ supportive care. Treatment should be based on judgment of the physician in response to reactions of the patient.

For further information consult the Material Safety Data Sheet.

Do not ship or store with food, feeds, drugs or clothing.

**ENVIRONMENTAL HAZARDS**
This product is highly toxic to fish, aquatic plants and aquatic invertebrates and is not labelled for application to water surfaces. Keep out of wetlands, lakes, ponds, streams, rivers and wildlife habitats at the edge of bodies of water. Do not contaminate water by cleaning of equipment or disposal of wastes. Sensitive terrestrial and aquatic habitat must be protected. A buffer zone should be maintained to avoid overspray and drift into these habitats (refer to Ground Application and/or Aerial Application sections on the buffer zone requirements and spray drift control recommendations). Examples of habitat which may border treated areas are shelterbelts, wetlands (e.g., potholes), sloughs, dry slough borders, non-target wooded areas and vegetated areas adjacent to water.

This product contains a petroleum distillate which is moderately to highly toxic to aquatic organisms. Avoid contamination of aquatic systems during application. Do not contaminate these systems through direct application, disposal of waste or cleaning equipment.

**STORAGE**
Do not contaminate water, food or feed by storage or disposal. Store above -2$^{\circ}$C or agitate container before use.

**DISPOSAL**
**Recyclable Containers:**
Do not reuse this container for any purpose. This is a recyclable container, and is to be disposed of at a container collection site. Contact your local distributor/dealer or municipality for the location of the nearest collection site. Before taking the container to the collection site:

1. Triple- or pressure-rinse the empty container. Add the rinsings to the spray mixture in the tank.
2. Make the empty, rinsed container unsuitable for further use.

If there is no container collection site in your area, dispose of the container in accordance with provincial requirements.

**Returnable Containers:**
Do not reuse this container for any purpose. For disposal, this empty container may be returned to the point of purchase (distributor/dealer).

For information on disposal of unused, unwanted product, contact the manufacturer or the provincial regulatory agency. Contact the manufacturer and the provincial regulatory agency in case of a spill, and for clean-up of spills.

**GENERAL INFORMATION**
Garlon 4 herbicide is recommended for the control of undesirable woody plants and annual and perennial broadleaved weeds in pastures and rangelands, and in non-crop areas, including: rights-of-way, electrical power lines, communication lines, pipelines, roadsides and railroads, fencerows and around farm buildings, military bases, industrial, manufacturing and storage sites.

Among the woody plants controlled at the lower rate are:

| | | |
|---|---|---|
| alder | elderberry | pines♦ |
| ash | elm♦ | poplar |
| aspen | hawthorn | red maple♦ |
| basswood | hickory | raspberry♦ |
| beech | hop-hornbeam | sassafras |
| birch | honey locust♦ | sumac |
| blackberry | locust | sycamore |
| buckthorn | maples | tamarack |
| cherry♦ | mulberry | wild rose |
| chokecherry♦ | oaks♦ | willow |
| cottonwood | poison oak | witchhazel |
| dogwood | | |

♦These species may require treatment at the higher rate and may need to be retreated the following year, particularly if the original treatment was made at the lower rate.

Among the annual and perennial broadleaved weeds controlled are:

| | | |
|---|---|---|
| burdock | field bindweed | smooth bedstraw |
| chicory | lamb's-quarters | vetch |
| curled dock | ragweed | wild lettuce |
| dandelion | smartweed | |

**GENERAL USE PRECAUTIONS**

- Do not apply this product in a manner inconsistent with the label.
- Do not apply Garlon 4 directly to, or otherwise permit it to come into direct contact with desirable crops or other desirable broadleaved plants or non-target species and do not permit spray mists containing Garlon 4 to drift onto them.

If this pest control product is to be used on a commodity that may be exported to the U.S. and you require information on acceptable residue levels in the U.S., contact 1-866-375-4648 or www.cropro.org/.

**Avoid Spray Drift**
Apply only when there is little or no hazard from spray drift. Small quantities of the spray, which may not be visible, may seriously injure susceptible crops and damage sensitive non-target habitat. A method must be used to detect air movement, lapse conditions or temperature inversions (stable air) such as the use of balloons or a continuous smoke column at or near the spray site or a smoke generator on the spray equipment. If the smoke develops into layers or indicates a potential for hazardous spray drift, DO NOT SPRAY.

**PREHARVEST/GRAZING INTERVALS**
Treated areas may be grazed by livestock or harvested for livestock feed provided that the following intervals are adhered to:

**Grazing or harvesting green forage**

I. Lactating dairy animals
   A. Up to 4.7 L/ha: withhold lactating dairy animals from consuming treated green forage for 14 days following treatment.
   B. 4.7 to 8.0 L/ha: withhold lactating dairy animals from consuming treated forage for 60 days following treatment.

II. Other livestock
   A. Up to 4.7 L/ha: no grazing restriction.
   B. 4.7 to 8.0 L/ha: do not graze or harvest green forage from treated area for 14 days following treatment.

III. **NOTE:** If less than 25% of a grazed area is treated, there is no grazing restriction (for other livestock only).

**Haying (harvesting of dried forage)**

I. Lactating dairy animals
   A. For treatments up to 8.0 L/ha do not feed lactating dairy animals hay which had been harvested within 60 days of treatment.

II. Other livestock
   A. Up to 4.7 L/ha: do not harvest for 7 days following treatment.
   B. 4.7 to 8.0 L/ha: do not harvest hay for 14 days following treatment.

**Slaughter Withhold**
Withdraw livestock from grazing treated grass or consumption of treated hay at least 3 days prior to slaughter.

**DIRECTIONS FOR USE**
**General**
For best results, applications of Garlon 4 should be made when woody plants and weeds are actively growing. Use higher rates when hard-to-control species such as ash, chokecherry, elm, maple (other than vine or big leaf), oaks or pine are present. If lower rates are used on hard-to-control species, resprouting may occur and retreatment may be necessary the following year.

When using a drift control agent, follow the manufacturer's directions for the correct mixing sequence.

**Ground Application**
Consult with the appropriate provincial authorities about use permits and the establishment of buffer zones.

**Use Precautions**
Garlon 4 is not registered for application to water surfaces including lakes, ponds and streams and is highly toxic to fish, aquatic plants and aquatic invertebrates. Do not overspray such areas. In order to reduce the hazard of drift to non-target plants, aquatic species or sensitive habitat, ensure that appropriate buffer zones are maintained and refer to the section Spray Drift Control.

**Spray Drift Control**
The potential for spray drift with ground broadcast applications can be reduced by:

- Apply a coarse spray using large droplet producing nozzle tips. Do not apply with cone-type insecticide or other nozzles that produce a fine droplet spray.
- Use of Radiarc® or Nalco-Trol® or an equivalent drift control system or additive.
- Keep the spray boom as low as possible.
- Use a spray pressure no greater than is required to obtain a proper spray pattern for adequate plant coverage.
- For ground application, do not apply Garlon 4 when wind velocity and direction pose a risk of spray drift. Apply when wind speed is low. For aerial application, please refer to "Use Precautions" for appropriate buffer zones under "Restricted Use."
- If a spray thickening agent is used, follow all use directions and precautions on the product label. When using a power sprayer and handgun, direct sprays no higher than the tops of the target plants.

**GROUND EQUIPMENT APPLICATIONS**
**Single Stem Foliar**
For control of woody plants up to 2.5 m in height, use Garlon 4 at rates of 4 to 8 L in enough water to make 1000 L of spray solution. Use the higher rate for late summer application when growth rates are reduced or when hard-to-control species are present. Spray brush to the point of runoff. Coverage should be thorough to wet all foliage. To minimize spray drift do not use pressures exceeding 1400 kPa at the spray nozzle. Direct the spray away from crops or desired non-target vegetation. Use of a drift control system is suggested to minimize spray drift. For woody plants exceeding 2.5 m in height cut and spray regrowth or use one of the basal application methods.

**Low Volume Foliar**
For control of woody plants up to 2.5 m in height use this technique with knapsack or backpack sprayers equipped with flat fan or solid cone nozzles. Power sprayers and handguns may also be used. For control of woody plants, mix 1 to 5 L of Garlon 4 in enough water to make 100 L of spray solution. Use of a rate in the upper end of the recommended range is suggested for control of basal sprouting and root suckering species and for tall, dense brush. Direct the spray solution to thoroughly wet the foliage of the target plants but not to the point of runoff. Apply after full leafout, but before autumn colouration. For woody plants exceeding 2.5 m in height cut and spray regrowth or use one of the basal application methods.

**Broadcast Foliar**
For woody plant control and broadleaved weed control, make applications with equipment that will assure uniform coverage of the low spray volume applied. Do not use pressure exceeding 275 kPa at the spray nozzle. Apply any time during the growing season. Use the higher rates for late summer applications when growth rates are reduced or when hard-to-control species are present.

**Woody Plant Control**
Mix 4 to 8 L of Garlon 4 in a minimum of 200 L of water per hectare to ensure uniform coverage.

**Broadleaved Weed Control**
Mix 1 to 4 L of Garlon 4 in a minimum of 200 L of water per hectare to ensure uniform coverage.

**BASAL BARK APPLICATIONS**
**General Information and Mixing Instructions**
For control of woody plants in rights-of-way, military bases, industrial sites and non-crop areas, use Garlon 4 in oil mixtures prepared and applied as described below. Use a diluent such as mineral oil or vegetable oil. Add Garlon 4 to the required amount of oil in the mixing tank

and mix thoroughly. When mixing with oils commercially formulated for basal bark herbicide applications, read and follow the use directions and precautions on the product label prepared by the oil's manufacturer.

Use the higher spray mixture concentration of Garlon 4 when treating basal sprouting and root suckering species or when applying during the dormant season. Use low nozzle pressure to minimize spattering of spray solution off the target stem.

**One-Sided Low Volume**
To control woody plants with stems less than 15 cm in basal diameter, mix 20 to 30 L of Garlon 4 in enough oil diluent to make 100 L of spray mixture. Apply with a knapsack or backpack sprayer using a flat fan or solid cone nozzle, or wick attachement. Low pump pressures of 70 to 210 kPa are recommended. Spray the basal parts of at least one side of each stem to thoroughly wet the lower 30 cm, including the root collar area, but not to the point of runoff. Apply at any time, including the winter months, except when snow or water prevent spraying at the ground line.

**Streamline**
To control woody plants, mix 20 to 30 L of Garlon 4 in enough oil to make 100 L of spray mixture. Apply using a knapsack or backpack sprayer with a flat fan or solid cone nozzle, or wick attachment. Low pump pressures of 70 to 210 kPa are recommended. Apply sufficient spray to one side of stems less than 8 cm in basal diameter to form a band 5 cm in width. When the optimum amount of spray mixture is applied, the treated zone should widen to encircle the stem within approximately 30 minutes. Treat both sides of stems which are 8 to 15 cm in basal diameter. Direct the spray at a point on the stem that is approximately 30 to 50 cm above ground level. Optimal results are achieved when applications are made to young vigorously growing stems which have not developed the thicker bark characteristics of slower growing, understory trees in older stands. Apply at any time, including the winter months, except when snow or water prevents spraying at the desired height above ground level.

**Cut Stump Treatment**
To control resprouting of cut stumps of woody species, mix 20 to 30 L of Garlon 4 in enough oil to make 100 L of spray mixture. Apply with a backpack or knapsack sprayer using a flat fan or a solid cone nozzle. Low pump pressures of 70 to 210 kPa are recommended. Thoroughly wet the outer portion of the cut surface adjacent to the cambium and the sides of the stumps, including the root collar area, but not to the point of runoff. Apply at any time, including the winter months, except when snow or water prevents spraying to the ground line. Care must be given to ensure treatment of all cut stems in a clump.

**NOTE TO BUYER/USER:** READ THE FOLLOWING BEFORE USING THIS PRODUCT FOR SPECIAL USE APPLICATIONS: The DIRECTIONS FOR USE for this product for the use(s) described below were developed by persons other than Dow AgroSciences Canada Inc. and are accepted for registration by Health Canada under the User Requested Minor Use Label Expansion program. Dow AgroSciences Canada Inc. itself makes no representation or warranty with respect to performance (efficacy) and/or crop tolerance (phytotoxicity) claims for this product when used on the crop(s) listed below.

Accordingly, the Buyer and User assume all liability arising, and agree to hold Dow AgroSciences Canada Inc. harmless from any claims based on efficacy and/or phytotoxicity in connection with the use(s) described below.

**DIRECTIONS FOR USE**

**LOWBUSH BLUEBERRY SITE PREPARATION:** Make one application per year. Apply as a directed ground spray. Direct contact of the spray with the blueberry plant will cause severe damage.

**Woody plants controlled:** alder, ash, birch, chokecherry†, maples (red maple†), and poplar.
†may require higher rates and a repeat application the following year for control.

**Application rate:** Refer to the **Basal Bark Application** section of the main Garlon 4 label for the application rate to use.

**RESTRICTED USE**
Garlon 4 may be applied by air for control of susceptible woody plants growing on rights-of-way, industrial sites and military bases.

**NOTICE TO USER:** This control product is to be used only in accordance with the directions on this label. It is an offence under the PEST CONTROL PRODUCTS ACT to use a control product under unsafe conditions.

**NATURE OF RESTRICTION:** This product is to be used only in the manner authorized; consult provincial pesticide regulatory authorities about use permits.

**DIRECTIONS FOR USE**
**Aerial Application**
Apply only by fixed-wing or rotary aircraft equipment which has been functionally and operationally calibrated for the atmospheric conditions of the area and the application rates and conditions of this label.

Label rates, conditions and precautions are product specific. Read and understand the entire label before opening this product. Apply only at the rate recommended for aerial application on this label. **Where no rate for aerial application appears for the specific use, this product cannot be applied by any type of aerial equipment.**

Ensure uniform application. To avoid streaked, uneven or overlapped application, use appropriate marking devices

**Use Precautions**
Apply only when meteorological conditions at the treatment site allow for complete and even crop coverage. Apply only under conditions of good practice specific to aerial application as outlined in the *Basic Knowledge Requirements for Pesticide Education in Canada: Applicator Core* and *Aerial Module*, developed by CAPCO.

Do not apply to any body of water. Avoid drifting of spray onto any body of water or other non-target areas. Specified buffer zones should be observed.

Coarse sprays are less likely to drift, therefore, avoid combinations of pressure and nozzle type that will result in fine particles (mist). Do not apply during periods of dead calm or when wind velocity and direction pose a risk of spray drift. Do not spray when the wind is blowing towards a nearby sensitive crop, garden, terrestrial habitat (such as shelter-belt) or aquatic habitat.

**Operator Precautions**
Do not allow the pilot to mix chemicals to be loaded onto the aircraft. Loading of premixed chemicals with a closed system is permitted.

It is desirable that the pilot have communication capabilities at each treatment site at the time of application.

The field crew and the mixer/loaders must wear chemical resistant gloves, coveralls and goggles or face shield during mixing/loading, cleanup and repair. Follow the more stringent label precautions in cases where the operator precautions exceed the generic label recommendations on the existing ground boom label.

All personnel on the job site must wash hands and face thoroughly before eating and drinking. Protective clothing, aircraft cockpit and vehicle cabs must be decontaminated regularly.

**Product Specific Precautions**
Read and understand the entire label before opening this product. If you have questions, call the manufacturer at 1-800-667-3852 or obtain technical advice from the distributor or your provincial agricultural representative. Application of this specific product must meet and/or conform to the precautions and application rates set out below.

**ENVIRONMENTAL HAZARDS**
This product is highly toxic to fish, aquatic plants and aquatic invertebrates and is not labelled for application to water surfaces. Keep out of wetlands, lakes, ponds, streams, rivers and wildlife habitats at the edge of bodies of water. A buffer zone should be maintained to avoid overspray and drift into these habitats. Do not contaminate water by cleaning of equipment or disposal of wastes.

Aerial application must only be done on the basis of provincial use permit. Buffer zones are specified to protect the sensitive areas as identified in the Environmental Hazards section of the product label.

Among the species controlled are:

| | | |
|---|---|---|
| alder | elderberry | pines♦ |
| ash | elm♦ | poplar |
| aspen | hawthorn | red maple♦ |
| basswood | hickory | raspberry♦ |
| beech | hop-hornbeam | sassafras |
| birch | honey locust♦ | sumac |
| blackberry | locust | sycamore |
| buckthorn | maples | tamarack |
| cherry♦ | mulberry | wild rose |
| chokecherry♦ | oaks♦ | willow |
| cottonwood | poison oak | witchhazel |
| dogwood | | |

♦These species may require treatment at the higher rate and may need to be retreated the following year, particularly if the original treatment was made at the lower rate.

**DIRECTIONS FOR USE:**
**AERIAL APPLICATION**
Garlon 4 may be applied by either fixed or rotary wing aircraft for the control of susceptible woody plants growing on rights-of-way, industrial sites and military bases. Use 4 to 8 L of Garlon 4 in a minimum spray volume of 30 L per hectare. Delivery systems suggested for use in applying Garlon 4 by air include: booms equipped with coarse droplet producing conventional disc and core nozzles (such as D8-46 or D10-46), the Microfoil® boom or the Thru-Valve® boom. Ensure uniform and adequate coverage is achieved and that equipment has been accurately calibrated. Use higher application rates and volumes when plants are dense or under drought conditions.

**USE PRECAUTIONS**
Garlon 4 is not registered for application to water surfaces including lakes, ponds and streams and is highly toxic to fish, aquatic plants and aquatic invertebrates. Do not overspray such areas. In order to reduce the hazard of drift to sensitive areas as identified in the Environmental Hazards section of the label, ensure that appropriate buffer zones are maintained as outlined below.

Use only closed mixing/loading systems for aerial application.

## BUFFER ZONE TABLES FOR GARLON 4 HERBICIDE

### A. BUFFER ZONES FROM AQUATIC HABITATS

A buffer zone should be maintained to avoid overspray and drift into wetlands, lakes, ponds, streams, rivers, and wildlife habitats at the edge of bodies of water. Appropriate buffer zones, based on aircraft type, boom height, droplet spectrum, and rate of application, are as follows.

**APPLICATION BY FIXED WING AIRCRAFT**

**1) DROPLET SPECTRUM: COARSE (VMD 351 µm; range 163 to 595 µm)**

| Rate of Application (L Garlon 4/ha) | Buffer Zones (m) from Aquatic Habitats (by Boom Height) † | | | |
|---|---|---|---|---|
| | ≤ 5 m | > 5-10 m | >10-20 m | >20-30 m |
| 4 L/ha | 10 | 31 | 71 | 112 |
| >4 to 6 L/ha | 18 | 43 | 94 | 150 |
| >6 to 8 L/ha | 26 | 56 | 122 | 205 |

**2) DROPLET SPECTRUM: VERY COARSE (VMD 461 µm; range 224 to 787 µm)**

| Rate of Application (L Garlon 4/ha) | Buffer Zones (m) from Aquatic Habitats (by Boom Height) | | | |
|---|---|---|---|---|
| | ≤ 5 m | > 5-10 m | >10-20 m | >20-30 m |
| 4 L/ha | 5 | 19 | 54 | 91 |
| >4 to 6 L/ha | 10 | 28 | 69 | 116 |
| >6 to 8 L/ha | 14 | 35 | 82 | 142 |

† Boom height is the distance between the target vegetation (e.g. canopy) and the boom of the aircraft. The buffer zone is the distance between the sensitive habitat and the downwind edge of the spray boom. For example, these charts are read as follows: at an application rate of 6 L/ha, a boom height of 10 m, and a coarse droplet spectrum (VMD 351 µm), maintain a 17 m buffer zone between aquatic habitats (e.g., wetlands, lakes, ponds, streams, rivers, and wildlife habitats at the edge of bodies of water) and the downwind edge of the spray boom.

**APPLICATION BY ROTARY AIRCRAFT**

**1) DROPLET SPECTRUM: COARSE (VMD 351 µm; range 163 to 595 µm)**

| Rate of Application (L Garlon 4/ha) | Buffer Zones (m) from Aquatic Habitats (by Boom Height) | | | |
|---|---|---|---|---|
| | ≤ 5 m | > 5-10 m | >10-20 m | >20-30 m |
| 4 L/ha | 5 | 13 | 47 | 86 |
| >4 to 6 L/ha | 8 | 17 | 59 | 108 |
| >6 to 8 L/ha | 12 | 20 | 72 | 144 |

**2) DROPLET SPECTRUM: VERY COARSE (VMD 461 µm; range 224 to 787 µm)**

| Rate of Application (L Garlon 4/ha) | Buffer Zones (m) from Aquatic Habitats (by Boom Height) | | | |
|---|---|---|---|---|
| | ≤ 5 m | > 5-10 m | >10-20 m | >20-30 m |
| 4 L/ha | 3 | 10 | 37 | 71 |
| >4 to 6 L/ha | 6 | 12 | 46 | 87 |
| >6 to 8 L/ha | 7 | 14 | 53 | 103 |

### B. BUFFER ZONES FROM TERRESTRIAL HABITATS

A buffer zone should be maintained to avoid overspray and drift into sensitive terrestrial wildlife habitats. Consult the Provincial Pesticide Authority regarding the determination of these areas. Appropriate buffer zones, based on aircraft type, boom height, droplet spectrum, and rate of application, are as follows.

**APPLICATION BY FIXED WING AIRCRAFT**

**1) DROPLET SPECTRUM: COARSE (VMD 351 µm; range 163 to 595 µm)**

| Rate of Application (L Garlon 4/ha) | Buffer Zones (m) from Terrestrial Habitats (by Boom Height) | | | |
|---|---|---|---|---|
| | ≤ 5 m | > 5-10 m | >10-20 m | >20-30 m |
| 4 L/ha | 18 | 36 | 69 | 99 |
| >4 to 6 L/ha | 26 | 45 | 82 | 116 |
| >6 to 8 L/ha | 31 | 53 | 92 | 132 |

**2) DROPLET SPECTRUM: VERY COARSE (VMD 461 µm; range 224 to 787 µm)**

| Rate of Application (L Garlon 4/ha) | Buffer Zones (m) from Terrestrial Habitats (by Boom Height) | | | |
|---|---|---|---|---|
| | ≤ 5 m | > 5-10 m | >10-20 m | >20-30 m |
| 4 L/ha | 14 | 27 | 56 | 82 |
| >4 to 6 L/ha | 18 | 35 | 69 | 98 |
| >6 to 8 L/ha | 21 | 40 | 76 | 112 |

**APPLICATION BY ROTARY AIRCRAFT**

**1) DROPLET SPECTRUM: COARSE (VMD 351 µm; range 163 to 595 µm)**

| Rate of Application (L Garlon 4/ha) | Buffer Zones (m) from Terrestrial Habitats (by Boom Height) | | | |
|---|---|---|---|---|
| | ≤ 5 m | > 5-10 m | >10-20 m | >20-30 m |
| 4 L/ha | 14 | 22 | 54 | 84 |
| >4 to 6 L/ha | 17 | 26 | 61 | 96 |
| >6 to 8 L/ha | 19 | 28 | 68 | 105 |

**2) DROPLET SPECTRUM: VERY COARSE (VMD 461 µm; range 224 to 787 µm)**

| Rate of Application (L Garlon 4/ha) | Buffer Zones (m) from Terrestrial Habitats (by Boom Height) | | | |
|---|---|---|---|---|
| | ≤ 5 m | > 5-10 m | >10-20 m | >20-30 m |
| 4 L/ha | 11 | 18 | 46 | 71 |
| >4 to 6 L/ha | 13 | 21 | 53 | 84 |
| >6 to 8 L/ha | 16 | 23 | 59 | 93 |

**Spray Drift Control**

Apply only when there is little or no hazard of spray drift since small quantities of product may injure susceptible crops and damage sensitive non-target habitats.

1. Do not apply Garlon 4 when wind velocity and direction pose a risk of spray drift.
2. Do not apply when the wind speed is greater than 16 km/hr.
3. Garlon 4 should not be applied at a boom height greater than 30 m above the target vegetation.
4. Aerial application should be made as close to the ground as possible while maintaining adequate coverage.
5. For helicopter application use pressures at the lower end of the range recommended by the nozzle manufacturer. For fixed wing application use pressures at the higher end of the range recommended by the nozzle manufacturer.
6. Use a boom length less than 75% of the wing span or rotor length.

7. Coarse spray droplets are less prone to drift, therefore avoid spray dispersal systems and settings that produce a large proportion of fine droplets in the spray pattern. Delivery systems suggested for use in applying Garlon 4 by air include: booms equipped with coarse droplet producing conventional disc and core nozzles (such as D8-46 or D10-46), straight stream coreless nozzles (such as D6 or D8), and the Microfoil or Thru-Valve boom. Conventional disc and core nozzles should be oriented straight back or at an angle of less than 30° down.
8. Do not apply by air when an air temperature inversion exists. Such condition is characterized by little or no wind and an air temperature near the ground that is lower than at higher levels. A method must be used to detect air movement, lapse conditions or temperature inversions such as the use of balloons or a continuous smoke column at or near the site.

**NOTICE TO USER:** This control product is to be used only in accordance with the directions on this label. It is an offense under the *Pest Control Products Act* to use a control product under unsafe conditions.

**NOTICE TO BUYER:** Seller's guarantee shall be limited to the terms set out on the label and, subject thereto, the buyer assumes the risk to persons or property arising from the use or handling of this product and accepts the product on that condition.

Radiarc® and Thru-Valve® are trademarks of Waldrum Specialties Inc.
Nalco-Trol® is a trademark of Alchem Inc.
Microfoil® is a trademark of Union Carbide Corp.

072302

Label Code: CN-21053-004-E

Replaces: CN-21053-003-E

Revision Notes:

- Basal Bark Applications: Conventional Volume and Thin Line directions for use deleted from label

**Material Safety Data Sheet**

# Garlon 4* Herbicide

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## In Case of Emergency Call CANUTEC at 613 996 6666

### 1. Product identification:

**Product name:** Garlon* 4 Herbicide
**Product code numbers:** 38322
**Product GMID numbers:** 4510, 5652
**MSDS number:** DASCI-012
**Effective date:** May 2, 2003
**Date printed:** December 23, 2003

**Supplier**:
Dow AgroSciences Canada Inc.
1144 - 29 Avenue N.E.
Calgary, Alberta,
Canada, T2E 7P1
www.dowagro.ca

**This product is regulated under authority of the Pest Control Products Act**

### 2. Composition:

| Component | CAS number | %(w/w) |
|---|---|---|
| Triclopyr (as butoxyethyl ester) (BEE) | 064700-56-7 | 61.6 |
| Other ingredients | | 38.4 |
| Including: | | |
| Kerosene | 008008-20-6 | |
| Proprietary surfactants | not available | |

### 3. Hazard Identification:

**Emergency Overview:**
This product is an amber liquid with a kerosene-like odor. This product is combustible. Contact may cause eye and skin irritation.

**Special Health Precautions**: This product contains a petroleum-based solvent. Health studies have shown that many petroleum-based solvents pose potential human health risks, which may vary from person to person. As a precaution, exposure to liquids, vapors, mists or fumes of solvents contained in this product should be minimized.

**Potential Health Effects:**
**Eyes:** This product may cause slight temporary eye irritation. Corneal injury is unlikely.
**Skin contact:** Prolonged or repeated exposure may cause skin irritation.
**Skin absorption:** Prolonged skin contact is not likely to result in this material being absorbed in harmful amounts. Repeated exposure may result in this product being absorbed in harmful amounts.
**Ingestion:** Small amounts swallowed incidental to normal handling operations are not likely to cause injury; however, swallowing larger amounts may cause injury. Aspiration into the lungs may occur during ingestion or vomiting, causing lung damage or even death due to chemical pneumonia.
**Inhalation:** Excessive exposure may cause irritation to upper respiratory tract. Inhalation of kerosene may result in central nervous system effects.

### 4. First - Aid Measures:

**Eyes:** Flush eyes thoroughly with water for fifteen minutes. Remove contact lenses after initial one to two minutes and continue flushing. If effects occur, get specialist medical attention.
**Skin:** Wash off in flowing water or shower.
**Ingestion:** Do not induce vomiting unless instructed to do so by qualified medical personnel. Get medical attention and transport to a medical facility at once.
**Inhalation:** Remove individual to fresh air. If breathing is difficult, qualified personnel should administer oxygen. Get medical attention if effects occur.

**Note to physician:**
This product contains a petroleum-based solvent. In case of ingestion, the decision of whether to induce vomiting or not should be made by the attending physician. If lavage is performed, endotracheal and/or esophageal control is suggested. Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach. Employ supportive care. Treatment should be based on the judgment of the physician in response to reactions of the patient.

### 5. Fire-fighting Measures:

**Auto-ignition temperature:** Not available
**Flash point:** 64°C (TCC)
**Flammability limits:** Not determined
**Extinguishing media:** Water fog, foam , $CO_2$, dry chemical.

**Sensitivity to mechanical impact/static discharge:** Not available
**Unusual fire and explosion hazards:** This product is combustible. Toxic irritating vapors may be formed if this product is involved in a fire. Contain fire-fighting water for future disposal.
**Fire-fighting equipment:** Use positive-pressure self-contained breathing apparatus and full turnout gear.

**6. Accidental Release Measures:**
Soak up small spills with absorbent material. Avoid the use of water in cleanup. If water is used for cleanup, it must be contained and disposed of in accordance with Section 13. Disposal Considerations. Triclopyr is an herbicide that acts on many broad-leafed plants including many shrubs and trees. Avoid contaminating soil near desirable vegetation. Do not allow spilled material to contaminate water supplies. For large spills, dike and barricade the affected area, eliminate ignition sources, and contact CANUTEC at 613 996 6666 and local authorities.

**7. Handling and Storage:**
**Handling:** Keep this product out of reach of children or animals. Do not use this product near heat or open flame. This product is harmful if swallowed, inhaled or absorbed through the skin. Avoid contact with eyes, skin and clothing. Remove and wash contaminated clothing before reuse. Contaminated clothing should be washed separately from domestic laundry and line-dried. Once used for contaminated clothing, the washing machine should be operated through a complete cycle with hot water and heavy duty detergent only, prior to use for domestic laundry. Users should wash hands and face before eating, drinking, chewing gum, using tobacco or the toilet.
**Storage:** Store this product at temperatures greater than -2°C or agitate before use. Do not ship or store with food, feed, seed, or clothing.

**8. Exposure Controls, Personal Protection and Exposure limits:**
**Exposure guidelines:**
Triclopyr BEE ester: Dow Industrial Hygiene Guide is 2 mg/m³, as acid equivalent, skin.
Kerosene: Dow Industrial Hygiene Guide is 10 mg/m³.
Proprietary surfactants: not available
**Engineering controls:** Provide general and/or local exhaust ventilation to control airborne levels below the exposure guidelines.
**Breathing:** Atmospheric levels should be maintained below the exposure guidelines. When respiratory protection is required for certain operations, use an approved air-purifying respirator.
**Protective Clothing:** For brief contact during manufacture, warehousing and transport, wear clean body-covering clothing. During operations where exposure to the concentrated product may occur, use protective clothing impervious to this product. Selection of specific items such as face-shield, respirator, boots, gloves, apron or full body suit will depend on the operation being carried out. Applicators and other field handlers, including persons repairing or cleaning application equipment, must wear clean body-covering clothing, impervious gloves and boots. In addition, persons making and/or transferring field dilutions of this product must wear an impervious apron.
**Eyes:** Use safety glasses
**Other protection:** None specified

**9. Physical and Chemical Properties:**
**Boiling point:** 150°C
**Vapor pressure:** 0.1 mm Hg at 37.8°C (as kerosene)
**Vapor density:** >1
**pH:** Not available
**Appearance:** Amber liquid
**Odor:** Kerosene-like
**Coefficient of water/oil distribution:** Not available
**Specific gravity:** 1.08
**Evaporation rate:** Not available
**Solubility in water:** Emulsifies
**Freezing point:** Not available
**Odor threshold:** Not available

**10. Stability and Reactivity:**
**Stability:** This product is combustible. Avoid sources of ignition if temperature is near or above flash point (64°C). This product is stable under normal storage conditions.
**Incompatibility:** Acid, base and oxidizing materials
**Hazardous decomposition products:** Hydrogen chloride, nitrogen oxides and phosgene may result under fire conditions.
**Hazardous polymerization:** Will not occur

**11. Toxicological Information:**
**Skin absorption:** LD50 (rabbit) is >2000 mg/kg and >5000 mg/kg (rat).
**Ingestion:** LD50 (rat) is 1581 mg/kg (male) and 1338 mg/kg (female).
**Inhalation:** Not available
**Sensitization:** Prolonged or frequently repeated skin contact may cause allergic skin reactions in some individuals. No allergic skin reaction is expected with the field-diluted product.
**Chronic effects:** Repeated excessive exposure may cause liver, kidney and blood effects.
**Cancer:** Triclopyr BEE did not cause cancer in long-term animal studies. In a lifetime animal dermal carcinogenicity study, an increased incidence of skin tumors was observed when kerosene was applied at doses that also produced skin irritation. The response was similar to that produced in skin by other types of chronic chemical/physical irritation No increase in tumors was observed when non-irritating dilutions of kerosene were applied at equivalent doses, indicating that kerosene is unlikely to cause skin cancer in the absence of long-term continued skin irritation. If the material is handled in accordance with proper industrial handling, exposures should not pose a carcinogenic risk to man.
**Birth defects:** For triclopyr BEE, birth defects are unlikely. Exposures having no effect on the mother should have no effect on the fetus. Triclopyr did not cause birth defects in animals; other effects were seen in the fetus only at doses which caused toxic effects to the mother.
**Reproductive effects:** In laboratory animal studies with triclopyr BEE, effects on reproduction have been seen only at doses that produced significant toxicity to the parent animals.
**Mutagenicity:** Results of *in-vitro* and animal mutagenicity studies with triclopyr BEE were negative.

**12. Ecological Information:**
Triclopyr (BEE) is considered not toxic to bees. Triclopyr (BEE) is highly toxic to fish and aquatic invertebrates on an acute basis. Triclopyr (acid) is slightly toxic to birds on an acute basis. Bio-concentration potential for triclopyr BEE is moderate. For more complete eco-toxicological information contact Dow AgroSciences at 800 667 3852.

**Degradation and Metabolism:**
**In soil:** Triclopyr BEE is rapidly hydrolyzed to the acid form under field conditions. As the acid, fairly rapid degradation of triclopyr then occurs by microbial activity, with an average half-life of 46 days, depending on soil and climatic conditions. The major product of degradation is 3,5,6-trichlro-2-pyridinol (which has a half-life in soil of 30 to 90 days) with smaller amounts of 3,5,6-trichloro-2-methoxypyridine.
**In plants:** In plants, the half-life of triclopyr is 3 to 10 days. The main metabolite is 3,5,6-trichloro-2-methoxypyridine.
**In animals:** In mammals, following oral administration, excretion is primarily via the urine as the unchanged compound. For details of minor urinary metabolites, see: C. Timchalk et al. Toxicology 1990, **62**, 71.

**13. Disposal Considerations:**
**Unused unwanted product:** Contact Dow AgroSciences or your provincial regulatory agency for disposal information.
**Container disposal:** Refer to the product label for instructions regarding cleaning and disposal of empty pesticide containers. If these instructions are missing or not understood, contact Dow AgroSciences at 800 667 3852 or your provincial regulatory agency for direction.

**14. Transport Information:**
This product is classified as "**Not Regulated**" under regulations of the Transportation of Dangerous Goods Act.

**15. Regulatory Information:**
**Pest Control Products Act registration number:** 21053
**For information phone:** 800 667 3852
**Master reference:** 004788
**MSDS status:** Revised Sections:
2. Composition
4. First - Aid Measures
6. Accidental Release Measures
11. Toxicological Information
12. Ecological Information
14. Transport Information
**Replaces MSDS dated:** April 2, 2002

**16. Other Information:**
**National Fire Code classification:** Class IIIA
**NFPA ratings:** Health: 2; Flammability: 2; Reactivity: 1.
**Notice:** The information contained in this Material Safety Data Sheet ("MSDS") is current

**Material Safety Data Sheet**
**Garlon 4* Herbicide**
***Trademark of Dow AgroSciences - Dow AgroSciences Canada Inc. is a licensed user**

**In Case of Emergency Call CANUTEC at 613 996 6666**

as of the effective date shown in Section 1 of this MSDS and may be subject to amendment by Dow AgroSciences Canada Inc. ("DASCI") at any time. DASCI accepts no liability whatsoever which results in any way from the use of MSDS, which are not published by DASCI, or have been amended without DASCI express written authorization. Users of this MSDS must satisfy themselves that they have the most recent and authorized version of this MSDS and shall bear all responsibility and liability with respect thereto. Any conflict or inconsistencies as to the contents of this MSDS shall be resolved in favor of DASCI by the most recent version of the MSDS published by DASCI.

# Specimen Label

Dow AgroSciences™

Glypro*

**Specialty Herbicide**

*Trademark of Dow AgroSciences LLC

**For control of annual and perennial weeds and woody plants in forests, non-crop sites, and in and around aquatic sites; also for use in wildlife habitat areas, for perennial grass release, and grass growth suppression.**

**Avoid contact of herbicide with foliage, green stems, exposed non-woody roots or fruit of crops, desirable plants and trees, because severe injury or destruction may result.**

| | |
|---|---|
| Active Ingredient(s): | |
| glyphosate† N-(phosphonomethyl)glycine, isopropylamine salt | 53.8% |
| Inert Ingredients | 46.2% |
| Total Ingredients | 100.0% |

†Contains 5.4 pounds per gallon glyphosate, isopropylamine salt (4 pounds per gallon glyphosate acid).

EPA Reg. No. 62719-324

**Keep Out of Reach of Children**

## CAUTION PRECAUCION

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

### Precautionary Statements

### Hazards to Humans and Domestic Animals

**Harmful If Inhaled**

**Avoid breathing spray mist. Remove contaminated clothing and wash before reuse. Wash thoroughly with soap and water after handling.**

### Personal Protective Equipment (PPE)

**Applicators and other handlers must wear:**

- Long-sleeved shirt and long pants
- Shoes plus socks.

Follow manufacturer's instructions for cleaning/maintaining PPE (Personal Protective Equipment). If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

### Engineering Controls

When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240 (d) (4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

### User Safety Recommendations

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.

### First Aid

**If inhaled:** Remove individual to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. Get medical attention.

### Environmental Hazards

Do not contaminate water when disposing of equipment washwaters. Treatment of aquatic weeds can result in oxygen depletion or loss due to decomposition of dead plants. This oxygen loss can cause fish suffocation.

In case of leak or spill, soak up and remove to a landfill.

### Physical or Chemical Hazards

Spray solutions of this product should be mixed, stored and applied using only stainless steel, aluminum, fiberglass, plastic or plastic-lined steel containers.

**Do not mix, store or apply this product or spray solutions of this product in galvanized steel or unlined steel (except stainless steel) containers or spray tanks.** This product or spray solutions of this product react with such containers and tanks to produce hydrogen gas, which may form a highly combustible gas mixture. This gas mixture could flash or explode, causing serious personal injury, if ignited by open flame, spark, welder's torch, lighted cigarette or other ignition source.

**Notice:** Read the entire label. Use only according to label directions. **Before buying or using this product, read "Warranty Disclaimer" and "Limitation of Remedies" elsewhere on this label.**

In case of emergency endangering health or the environment involving this product, call 1-800-992-5994. If you wish to obtain additional product information, visit our web site at www.dowagro.com.

Agricultural Chemical: Do not ship or store with food, feeds, drugs or clothing.

## Directions for Use

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.
Read all Directions for Use carefully before applying.

**This is an end-use product. Dow AgroSciences does not intend and has not registered it for reformulation. See individual container label for repackaging limitations.**

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your state or tribe, consult the agency responsible for pesticide regulation.

## Agricultural Use Requirements

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE), and restricted entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 4 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

- Coveralls
- Waterproof gloves
- Shoes plus socks

## Storage and Disposal

Do not contaminate water, food, feed or seed by storage or disposal.
**Storage: Store above 10°F (-12°C) to keep product from crystallizing.** Crystals will settle to the bottom. If allowed to crystallize, place in a warm room 68°F (20°C) for several days to redissolve and roll or shake container or recirculate in mini-bulk containers to mix well before using.
**Pesticide Disposal:** Wastes resulting from use of this product that cannot be used or chemically reprocessed should be disposed of in a landfill approved for pesticide disposal or in accordance with applicable Federal, state or local procedures.
**Container Disposal:** Emptied container retains vapor and product residue. Observe all labeled safeguards until container is cleaned, reconditioned or destroyed. Do not reuse this container. Triple rinse (or equivalent). Then puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

## General Information
**(How this product works)**

This product herbicide is a water-soluble liquid which mixes readily with water and nonionic surfactant to be applied as a foliar spray for the control or destruction of many herbaceous and woody plants. Glypro is intended for control of annual and perennial weeds and woody plants in forests, non-crop sites, and in and around aquatic sites; also for use in wildlife habitat areas, for perennial grass release and grass growth suppression.

The active ingredient in Glypro moves through the plant from the point of foliage contact to and into the root system. Visible effects on most annual weeds occur within 2 to 4 days, 7 days or more on most perennial weeds, and 30 days or more on most woody plants. Extremely cool or cloudy weather following treatment may slow the activity of this product and delay visual effects of control. Visible effects include gradual wilting and yellowing of the plant which advances to complete browning of above-ground growth and deterioration of underground plant parts.

Unless otherwise directed on this label, delay application until vegetation has emerged and reached the stages described for control of such vegetation under the “Weeds Controlled” section of this label.

Unemerged plants arising from unattached underground rhizomes or root stocks of perennials or brush will not be affected by the spray and will continue to grow. For this reason best control of most perennial weeds or brush is obtained when treatment is made at late growth stages approaching maturity.

Always use the higher rate of Glypro and surfactant within the recommended range when vegetation is heavy or dense, when treating dense multi-canopied sites or woody vegetation or difficult-to-control herbaceous or woody plants.

Do not treat weeds, brush or trees under poor growing conditions such as drought stress, disease or insect damage, as reduced control may result. Reduced control of target vegetation may also occur if foliage is heavily covered with dust at the time of treatment.

Reduced control may result when applications are made to woody plants or weeds following site disturbance or plant top growth removal from grazing, mowing, logging or mechanical brush control. For best results, delay treatment of such areas until resprouting and foliar growth has restored the target vegetation to the recommended stage of growth for optimum herbicidal exposure and control.

Rainfall or irrigation occurring within 6 hours after application may reduce effectiveness. Heavy rainfall or irrigation within 2 hours after application may wash the product off the foliage and a repeat treatment may be required.

Glypro has no herbicidal or residual activity in the soil. When this product comes in contact with soil (on the soil surface or as suspended soil or sediment in water) it is bound to soil particles. Under recommended use situations, once this product is bound to soil particles, it is not available for plant uptake and will not harm off-site vegetation where roots grow into the treatment area or if the soil is transported off-site. Under recommended use conditions, the strong affinity of this product to soil particles prevents this product from leaching out of the soil profile and entering ground water. The affinity between this product and soil particles remains until this product is degraded, which is primarily a biological degradation process carried out under both aerobic and anaerobic conditions by soil microflora.

Glypro does not provide residual weed control. For subsequent residual weed control, follow a label-approved herbicide program. Read and carefully observe the cautionary statements and all other information appearing on the labels of all herbicides used.

**NOTE:** Use of this product in any manner not consistent with this label may result in injury to persons, animals or crops, or other unintended consequences. When not in use, keep container closed to prevent spills and contamination.

Buyer and all users are responsible for all loss or damage in connection with the use or handling of mixtures of this product or other materials that are not expressly recommended in this label. Mixing this product with herbicides or other materials not recommended in this label may result in reduced performance.

**ATTENTION: Avoid drift. Extreme care must be used when applying this product to prevent injury to desirable plants and crops.**

Do not allow the herbicide solution to mist, drip, drift or splash onto desirable vegetation since minute quantities of this product can cause severe damage or destruction to the crop, plants or other areas on which treatment was not intended. The likelihood of plant or crop injury occurring from the use of this product is greatest when winds are gusty or in excess of 5 miles per hour or when other conditions, including lesser wind velocities, will allow spray drift to occur. When spraying, avoid combinations of pressure and nozzle type that will result in splatter or fine particles (mist) which are likely to drift. **Avoid applying at excessive speed or pressure.**

## Spray Drift Management

Avoiding spray drift at the application site is the responsibility of the applicator. The interaction of many equipment-and-weather-related factors determine the potential for spray drift. The applicator and the grower are responsible for considering all these factors when making decisions. The following drift management requirements must be followed to avoid off-target drift movement from aerial applications to agricultural field crops. These requirements do not apply to forestry applications, public health uses or to applications using dry formulations.

1. The distance of the outer most nozzles on the boom must not exceed 3/4 the length of the wingspan or rotor.
2. Nozzles must always point backward parallel with the air stream and never be pointed downwards more than 45 degrees. Where states have more stringent regulations, they should be observed.

The applicator should be familiar with and take into account the information covered in the Aerial Drift Reduction Advisory Information.

**Importance of Droplet Size**

The most effective way to reduce drift potential is to apply large droplets. The best drift management strategy is to apply the largest droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential, but will not prevent drift if applications are made improperly, or under unfavorable environmental conditions (see Wind, Temperature and Humidity, and Temperature Inversion section of this label).

**Controlling Droplet Size**

Volume-Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated flows product larger droplets.

Pressure-Use the lower spray pressures recommended for the nozzle. Higher pressure reduces droplet size and does not improve canopy penetration. When higher flow rates are needed, use higher flow rate nozzles instead of increasing pressure.

Number of nozzles-Use the minimum number of nozzles that provide uniform coverage.

Nozzle Orientation-Orienting nozzles so that the spray is released backwards, parallel to the airstream will produce larger droplets than other orientations. Significant deflection from the horizontal will reduce droplet size and increase drift potential.

Nozzle Type-Use a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles. Solid stream nozzles oriented straight back produce larger droplets than other nozzle types.

Boom Length-For some use patterns, reducing the effective boom length to less than 3/4 of the wingspan or rotor length may further reduce drift without reducing swath width.

Application-Applications should not be made at a height greater than 10 feet above the top of the largest plants unless a greater height is required for aircraft safety. Making applications at the lowest height that is safe reduces exposure of droplets to evaporation and wind.

**Swath Adjustment**

When applications are made with a cross-wind, the swath will be displaced downwind. Therefore, on the up and downwind edges of the field, the applicator must compensate for this displacement by adjusting the path of the aircraft upwind. Swath adjustment distance should increase, with increasing drift potential (higher wind, smaller drops, etc.).

**Wind**

Drift potential is lowest between wind speeds of 2-10 mph. However, many factors, including droplet size and equipment type determine drift potential at any given speed. Application should be avoided below 2 mph due to variable wind direction and high inversion potential. Note: Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect drift.

**Temperature and Humidity**

When making applications in low relative humidity, set up equipment to produce larger droplets to compensate for evaporation. Droplet evaporation is most severe when conditions are both hot and dry.

**Temperature Inversions**

Applications should not occur during a temperature inversion, because drift potential is high. Temperature inversions restrict vertical air mixing, which causes small suspended droplets to remain in a concentrated cloud. This cloud can move in unpredictable directions due to the light variable winds common during inversions. Temperature inversions are characterized by increasing temperatures with altitude and are common on nights with limited cloud cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of smoke from a ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a connected cloud (under low wind conditions) indicates an inversion, while

smoke that moves upwards and rapidly dissipates indicates good vertical air mixing.

**Sensitive Areas**

The pesticide should only be applied when the potential for drift to adjacent sensitive areas (e.g., residential areas, bodies of water, known habitat for threatened or endangered species, non-target crops) is minimal (e.g., when wind is blowing away from the sensitive areas).

## Mixing And Application Instructions

**Apply these spray solutions in properly maintained and calibrated equipment capable of delivering desired volumes. Hand-gun applications should be properly directed to avoid spraying desirable plants. Note: reduced results may occur if water containing soil is used, such as water from ponds and unlined ditches.**

### Mixing

Glypro mixes readily with water. Mix spray solutions of this product as follows:

1. Fill the mixing or spray tank with the required amount of water while adding the required amount of this product (see "Directions for Use" and "Weeds Controlled" sections of this label).
2. Near the end of the filling process, add the required surfactant and mix well. Remove hose from tank immediately after filling to avoid siphoning back into the water source.

**Note:** If tank mixing with Garlon* 3A herbicide, ensure that Garlon 3A is well mixed with at least 75 percent of the total spray volume before adding Glypro to the spray tank to avoid incompatibility.

During mixing and application, foaming of the spray solution may occur. To prevent or minimize foam, avoid the use of mechanical agitators, place the filling hose below the surface of the spray solution (only during filling), terminate by-pass and return lines at the bottom of the tank, and, if needed, use an approved anti-foam or defoaming agent.

Keep by-pass line on or near bottom of tank to minimize foaming. Screen size in nozzle or line strainers should be no finer than 50 mesh. Carefully select correct nozzle to avoid spraying a fine mist. For best results with conventional ground application equipment, use flat fan nozzles. Check for even distribution of spray droplets.

**IMPORTANT:** When using this product, unless otherwise specified, mix 2 or more quarts of a nonionic surfactant per 100 gallons of spray solution. Use a nonionic surfactant labeled for use with herbicides. The surfactant must contain 50 percent or more active ingredient.

Always read and follow the manufacturer's surfactant label recommendations for best results.

These surfactants should not be used in excess of 1 quart per acre when making **broadcast** applications.

Colorants or marking dyes approved for use with herbicides may be added to spray mixtures of this product. Colorants or dyes used in spray solutions of this product may reduce performance, especially at lower rates or dilutions. Use colorants or dyes according to the manufacturer's label recommendations.

Clean sprayer and parts immediately after using this product by thoroughly flushing with water and dispose of rinsate according to labeled use or disposal instructions.

Carefully observe all cautionary statements and other information appearing in the surfactant label.

## Application Equipment And Techniques

**ATTENTION:** AVOID DRIFT. EXTREME CARE MUST BE EXERCISED WHEN APPLYING THIS PRODUCT TO PREVENT INJURY TO DESIRABLE PLANTS AND CROPS.

Do not allow the herbicide solution to mist, drip, drift, or splash onto desirable vegetation since minute quantities of this product can cause severe damage or destruction to crops, plants, or other areas on which the treatment was not intended. The likelihood of plant or crop injury occurring from the use of this product is greatest when winds are gusty or in excess of 5 miles per hour or when other conditions, including lesser wind velocities, will allow spray drift to occur. When spraying, avoid combinations of pressure and nozzle type that will result in splatter or fine particles (mist) which are likely to drift. AVOID APPLYING AT EXCESSIVE SPEED OR PRESSURE.

**Note:** Use of this product in a manner not consistent with this label may result in injury to persons, animals, or crops, or other unintended consequences. When not in use, keep container closed to prevent spills and contamination.

### Aerial Equipment

See the supplemental label for use of this product by air in California.

**For control of weed or brush species listed in this label using aerial application equipment**: For aerial broadcast application, unless otherwise specified, apply the rates of Glypro and surfactant recommended for broadcast application in a spray volume of 3 to 20 gallons of water per acre. See the "Weeds Controlled" section of this label for labeled annual and herbaceous weeds and woody plants and broadcast rate recommendations. Aerial applications of this product may only be made as specifically recommended in this label.

**Forestry and Utility Rights-of-Way Sites:** It is recommended that Glypro be applied by helicopter only in forestry sites and utility rights-of-way. Apply the rate of Glypro and surfactant recommended for broadcast sprays in a spray volume of 5 to 30 gallons per acre.

**In California, aerial application may be made only in non-residential, forestry sites or chapparal areas.**

**AVOID DRIFT. Do not apply during inversion conditions, when winds are gusty or under any other condition which will allow drift. Drift may cause damage to any vegetation contacted to which treatment is not intended. To prevent injury to adjacent desirable vegetation, appropriate buffer zones must be maintained.**

Coarse sprays are less likely to drift; therefore, do not use nozzles or nozzle configurations which dispense spray as fine spray droplets. Do not angle nozzles forward into the airstream and do not increase spray volume by increasing nozzle pressure.

Drift control additives may be used. When a drift control additive is used, read and carefully observe the cautionary statements and all other information appearing in the additive label. The use of a drift control agent for conifer and herbaceous release applications may result in conifer injury and is not recommended.

**Ensure uniform application.** To avoid streaked, uneven or overlapped application, use appropriate marking devices.

Thoroughly wash aircraft, especially landing gear, after each day of spraying to remove residues of this product accumulated during spraying or from spills. **Prolonged exposure of this product to uncoated steel surfaces may result in corrosion and possible failure of the part. Landing gear are most susceptible.** The maintenance of an organic coating (paint) which meets aerospace specification MIL-C-38413 may prevent corrosion.

## Ground Broadcast Equipment

**For control of weed or brush species listed in this label using conventional boom equipment:** For ground broadcast application, unless otherwise specified, apply the rates of Glypro and surfactant recommended for broadcast application in a spray volume of 3 to 30 gallons of water per acre. See the "Weeds Controlled" section of this label for labeled annual and herbaceous weeds and woody plants and broadcast rate recommendations. As density of vegetation increases, spray volume should be increased within the recommended range to ensure complete coverage. Carefully select correct nozzle to avoid spraying a fine mist. For best results with ground application equipment, use flat fan nozzles. Check for even distribution of spray droplets.

**Forestry and Utility Rights-of-Way Sites:** Glypro is recommended for broadcast applications using suitable ground equipment in forestry sites, utility sites, and utility rights-of way. Apply the recommended rates of Glypro and surfactant in a spray volume of 10 to 60 gallons per acre. Check for even distribution of spray droplets.

## Hand-Held and High-Volume Equipment
**(Use Coarse Sprays Only)**

**For control of weeds listed in this label using knapsack sprayers or high-volume spraying equipment utilizing handguns or other suitable nozzle arrangements:**

**High volume sprays:** Prepare a **3/4 to 2 percent solution** of this product in water, add a nonionic surfactant and apply to foliage of vegetation to be controlled. For specific rates of application and instructions for control of various annual and perennial weeds, see the "Weeds Controlled" section in this label.

Applications should be made on a spray-to-wet basis. Spray coverage should be uniform and complete. Do not spray to point of runoff.

**Low volume directed sprays**: Glypro may be used as a **5 to 10 percent solution** in low-volume directed sprays for spot treatment of trees and brush. This treatment method is most effective in areas where there is a low density of undesirable trees or brush. If a straight stream nozzle is used, start the application at the top of the targeted vegetation and spray from top to bottom in a lateral zig-zag motion. Ensure that at least 50 percent of the leaves are contacted by the spray solution. For flat fan and cone nozzles and with hand-directed mist blowers, mist the application over the foliage of the targeted vegetation. Small, open-branched trees need only be treated from one side. If the foliage is thick or there are multiple root sprouts, applications must be made from several sides to ensure adequate spray coverage.

Prepare the desired volume of spray solution by mixing the amount of this product in water, shown in the following table:

**Spray Solution**

| Desired Volume | Amount of Glypro | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **3/4%** | **1%** | **1 1/4%** | **1 1/2%** | **2%** | **5%** | **8%** | **10%** |
| **1 gal** | 1 fl oz | 1 1/3 fl oz | 1 2/3 fl oz | 2 fl oz | 2 2/3 fl oz | 6 1/2 fl oz | 10 1/4 fl oz | 12 ¾ fl oz |
| **25 gal** | 1 1/2 pt | 1 qt | 1 1/4 qt | 1 1/2 qt | 2 qt | 5 qt | 2 gal | 2.5 gal |
| **100 gal** | 3 qt | 1 gal | 1 1/4 gal | 1 1/2 gal | 2 gal | 5 gal | 8 gal | 10 gal |

2 tablespoons = 1 fluid ounce

For use in knapsack sprayers, it is suggested that the recommended amount of this product be mixed with water in a larger container. Fill the knapsack sprayer with the mixed solution and add the correct amount of surfactant.

## Selective Equipment

This product may be applied through shielded sprayers or wiper application equipment. This equipment may be used to selectively control undesirable vegetation without harming desirable vegetation.

Shielded sprayers direct the herbicide solution onto weeds while shielding desirable vegetation from the spray solution. Any recommended rate or tank mixture of this product may be used employing this equipment.

Wiper applicators physically wipe product directly onto undesirable vegetation. Care should be taken to avoid wiping desirable vegetation. Use a 33 to 100 percent solution of this product, diluted in water for wiper applications. Use a 33 percent solution for wick or gravity feed systems. Higher concentrations may be used in pressurized systems that are capable of handling thicker solutions. Addition of a nonionic surfactant at a rate of 10 percent by volume of total herbicide solution is recommended.

## Weeds Controlled

### Annual Weeds

Apply to actively growing annual grasses and broadleaf weeds.

Allow at least 3 days after application before disturbing treated vegetation. After this period the weeds may be mowed, tilled or burned. See "Directions for Use," "General Information" and "Mixing and Application Instructions" for labeled uses and specific application instructions.

**Broadcast Application Rates:** Use 1 1/2 pints of this product per acre plus 2 or more quarts of a nonionic surfactant per 100 gallons of spray solution if weeds are less than 6 inches tall. If weeds are greater than 6 inches tall, use 2 ½ pints of this product per acre plus 2 or more quarts of an approved nonionic surfactant per 100 gallons of spray solution.

**Hand-Held, High-Volume Application Rates:** Use a 3/4 percent solution of this product in water plus 2 or more quarts of a nonionic surfactant per 100 gallons of spray solution and apply to foliage of vegetation to be controlled.

**When applied as directed, Glypro plus nonionic surfactant will control the following annual weeds:**

| **Common Name** | **Scientific Name** |
|---|---|
| Balsamapple† | *Momordica charantia* |
| Barley | *Hordeum vulgare* |
| Barnyardgrass | *Echinochloa crus-galli* |
| Bassia, fivehook | *Bassia hyssopifolia* |
| Bluegrass, annual | *Poa annua* |
| Bluegrass, bulbous | *Poa bulbosa* |
| Brome | *Bromus spp.* |
| Buttercup | *Ranunculus spp.* |
| Cheat | *Bromus secalinus* |
| Chickweed, mouseear | *Cerastium vulgatum* |
| Cocklebur | *Xanthium strumarium* |
| Corn, volunteer | *Zea mays* |
| Crabgrass | *Digitaria spp.* |
| Dwarfdandelion | *Krigia cespitosa* |
| Falseflax, smallseed | *Camelina microcarpa* |
| Fiddleneck | *Amsinckia spp.* |
| Flaxleaf fleabane | *Conyza bonariensis* |
| Fleabane | *Erigeron spp.* |
| Foxtail | *Setaria spp.* |
| Foxtail, Carolina | *Alopecurus carolinianus* |
| Groundsel, common | *Senecio vulgaris* |
| Horseweed/Marestail | *Conyza canadensis* |
| Kochia | *Kochia scoparia* |
| Lambsquarters, common | *Chenopodium album* |
| Lettuce, prickly | *Lactuca serriola* |
| Morningglory | *Ipomoea spp.* |
| Mustard, blue | *Chorispora tenella* |
| Mustard, tansy | *Descurainia pinnata* |
| Mustard, tumble | *Sisymbrium altissimum* |
| Mustard, wild | *Sinapis arvensis* |
| Oats, wild | *Avena fatua* |
| Panicum | *Panicum spp.* |
| Pennycress, field | *Thlaspi arvense* |
| Pigweed, redroot | *Amaranthus retroflexus* |
| Pigweed, smooth | *Amaranthus hybridus* |
| Ragweed, common | *Ambrosia artemisiifolia* |
| Ragweed, giant | *Ambrosia trifida* |
| Rocket, London | *Sisymbrium irio* |
| Rye | *Secale cereale* |
| Ryegrass, Italian†† | *Lolium multiflorum* |
| Sandbur, field | *Cenchrus spp.* |
| Shattercane | *Sorghum bicolor* |
| Shepherd's-purse | *Capsella bursa-pastoris* |
| Signalgrass, broadleaf | *Brachiaria platyphylla* |
| Smartweed, Pennsylvania | *Polygonum pensylvanicum* |
| Sowthistle, annual | *Sonchus oleraceus* |
| Spanishneedles†† | *Bidens bipinnata* |
| Stinkgrass | *Eragrostis cilianensis* |
| Sunflower | *Helianthus annuus* |
| Thistle, Russian | *Salsola kali* |
| Spurry, umbrella | *Holosteum umbellatum* |
| Velvetleaf | *Abutilon theophrasti* |
| Wheat | *Triticum aestivum* |
| Witchgrass | *Panicum capillare* |

†Apply with hand-held equipment only.
††Apply 3 pints of this product per acre.

Annual weeds will generally continue to germinate from seed throughout the growing season. Repeat treatments will be necessary to control later germinating weeds.

### Perennial Weeds

Apply Glypro to control most vigorously growing perennial weeds. Unless otherwise directed, apply when target plants are actively growing and most have reached early head or early bud stage of growth. Unless otherwise directed, allow at least 7 days after application before disturbing vegetation.

**NOTE**: If weeds have been mowed or tilled, do not treat until regrowth has reached the recommended stages. Fall treatments must be applied before a killing frost.

Repeat treatments may be necessary to control weeds regenerating from underground parts or seed.

**Specific Weed Control Recommendations:** For perennial weeds, apply the recommended rate plus 2 or more quarts of a nonionic surfactant per 100 gallons of spray solution. See the "General Information", "Directions for Use" and "Mixing and Application" sections in this label for specific uses and application instructions.

**When applied as directed, Glypro plus nonionic surfactant will control the following perennial weeds:** (Numbers in parentheses "(-)" following common name of a listed weed species refer to "Specific Perennial Weed Control Recommendations" for that weed which follow the species listing.)

| **Common Name** | **Scientific Name** |
|---|---|
| Alfalfa (31) | *Medicago sativa* |
| Alligatorweed† (1) | *Alternanthera philoxeroides* |
| Anise/Fennel (31) | *Foeniculum vulgare* |
| Artichoke, Jerusalem (31) | *Helianthus tuberosus* |
| Bahiagrass (31) | *Paspalum notatum* |
| Bermudagrass (2) | *Cynodon dactylon* |
| Bindweed, field (3) | *Convolvulus arvensis* |
| Bluegrass, Kentucky (12) | *Poa pratensis* |

| | |
|---|---|
| Blueweed, Texas (3) | *Helianthus ciliaris* |
| Brackenfern (4) | *Pteridium spp.* |
| Bromegrass, smooth (12) | *Bromus inermis* |
| Canarygrass, reed (12) | *Phalaris arundinacea* |
| Cattail (5) | *Typha spp.* |
| Clover, red (31) | *Trifolium pratense* |
| Clover, white (31) | *Trifolium repens* |
| Cogongrass (6) | *Imperata clylindrica* |
| Cordgrass (7) | *Spartina spp.* |
| Cutgrass, giant† (8) | *Zizaniopsis miliacea* |
| Dallisgrass (31) | *Paspalum dilatatum* |
| Dandelion (31) | *Taraxacum officinale* |
| Dock, curly (31) | *Rumex crispus* |
| Dogbane, hemp (9) | *Apocynum cannabinum* |
| Fescue (31) | *Festuca spp.* |
| Fescue, tall (10) | *Festuca arundinacea* |
| Guineagrass (11) | *Panicum maximum* |
| Hemlock, poison (31) | *Conium maculatum* |
| Horsenettle (31) | *Solanum carolinense* |
| Horseradish (9) | *Armoracia rusticana* |
| Ice Plant (22) | *Mesembryanthemum crystallinum* |
| Johnsongrass (12) | *Sorghum halepense* |
| Kikuyugrass (21) | *Pennisetum clandestinum* |
| Knapweed (9) | *Centaurea repens* |
| Lantana (13) | *Lantana camara* |
| Lespedeza, common (31) | *Lespedeza striata* |
| Lespedeza, sericea (31) | *Lespedeza cuneata* |
| Loosestrife, purple (14) | *Lythrum salicaria* |
| Lotus, American (15) | *Nelumbo lutea* |
| Maidencane (16) | *Panicum hematomon* |
| Milkweed (17) | *Asclepias spp.* |
| Muhly, wirestem (21) | *Muhlenbergia frondosa* |
| Mullein, common (31) | *Verbascum thapsus* |
| Napiergrass (31) | *Pennisetum purpureum* |
| Nightshade, silverleaf (3) | *Solanum elaeagnifolium* |
| Nutsedge, purple (18) | *Cyperus rotundus* |
| Nutsedge, yellow (18) | *Cyperus esculentus* |
| Orchardgrass (12) | *Dactylis glomerata* |
| Pampasgrass (19) | *Cortaderia jubata* |
| Paragrass (16) | *Brachiaria mutica* |
| Phragmites†† (20) | *Phragmites spp.* |
| Quackgrass (21) | *Agropyron repens* |
| Reed, giant (22) | *Arundo donax* |
| Ryegrass, perennial (12) | *Lolium perenne* |
| Smartweed, swamp (31) | *Polygonum coccineum* |
| Spatterdock (23) | *Nuphar luteum* |
| Starthistle, yellow (31) | *Centaurea solstitialis* |
| Sweet potato, wild† (24) | *Ipomoea pandurata* |
| Thistle, artichoke (25) | *Cynara cardunculus* |
| Thistle, Canada (25) | *Cirsium arvense* |
| Timothy (12) | *Phleum pratense* |
| Torpedograss† (26) | *Panicum repens* |
| Tules, common (27) | *Scirpus acutus* |
| Vaseygrass (31) | *Paspalum urvillei* |
| Velvetgrass (31) | *Holcus spp.* |
| Waterhyacinth (28) | *Eichornia crassipes* |
| Waterlettuce (29) | *Pistia stratiotes* |
| Waterprimrose (30) | *Ludwigia spp.* |
| Wheatgrass, western (12) | *Agropyron smithii* |

†Partial control.

††Partial control in southeastern states. See "Specific Weed Control Recommendations" below.

**Specific Perennial Weed Control Recommendations:**

1. **Alligatorweed:** Apply 6 pints of this product per acre as a broadcast spray or as a 1 1/4 percent solution with hand-held equipment to provide partial control of alligatorweed. Apply when most of the target plants are in bloom. Repeat applications will be required to maintain such control.
2. **Bermudagrass:** Apply 7 1/2 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Apply when target plants are actively growing and when seedheads appear.
3. **Bindweed, field / Silverleaf Nightshade / Texas Blueweed:** Apply 6 to 7 1/2 pints of this product per acre as a broadcast spray west of the Mississippi River and 4 1/2 to 6 pints of this product per acre east of the Mississippi River. With hand-held equipment, use a 1 1/2 percent solution. Apply when target plants are actively growing and are at or beyond full bloom. For silverleaf nightshade, best results can be obtained when application is made after berries are formed. Do not treat when weeds are under drought stress. New leaf development indicates active growth. For best results apply in late summer or fall.
4. **Brackenfern:** Apply 4 1/2 to 6 pints of this product per acre as a broadcast spray or as a 3/4 to 1 percent solution with hand-held equipment. Apply to fully expanded fronds which are at least 18 inches long.
5. **Cattail:** Apply 4 1/2 to 6 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Apply when target plants are actively growing and are at or beyond the early-to-full bloom stage of growth. Best results are achieved when application is made during the summer or fall months.
6. **Cogongrass:** Apply 4 1/2 to 7 1/2 pints of this product per acre as a broadcast spray. Apply when cogongrass is at least 18 inches tall and actively growing in late summer or fall. Allow 7 or more days after application before tillage or mowing. Due to uneven stages of growth and the dense nature of vegetation preventing good spray coverage, repeat treatments may be necessary to maintain control.
7. **Cordgrass:** Apply 4 1/2 to 7 1/2 pints of this product per acre as a broadcast spray or as a 1 to 2 percent solution with hand-held equipment. Schedule applications in order to allow 6 hours before treated plants are covered by tidewater. The presence of debris and silt on the cordgrass plants will reduce performance. It may be necessary to wash targeted plants prior to application to improve uptake of this product into the plant.
8. **Cutgrass, giant:** Apply 6 pints of this product per acre as a broadcast spray or as a 1 percent solution with hand-held equipment to provide partial control of giant cutgrass. Repeat applications will be required to maintain such control, especially where vegetation is partially submerged in water. Allow for substantial regrowth to the 7 to 10-leaf stage prior to retreatment.
9. **Dogbane, hemp / Knapweed / Horseradish:** Apply 6 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the late bud-to-flower stage of growth. For best results, apply in late summer or fall.
10. **Fescue, tall:** Apply 4 1/2 pints of this product per acre as a broadcast spray or as a 1 percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the boot-to-head stage of growth. When applied prior to the boot stage, less desirable control may be obtained.
11. **Guineagrass:** Apply 4 1/2 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Apply when target plants are actively growing and when most have reached at least the 7-leaf stage of growth.

12. **Johnsongrass / Bluegrass, Kentucky / Bromegrass, smooth / Canarygrass, reed / Orchardgrass / Ryegrass, perennial / Timothy / Wheatgrass, western:** Apply 3 to 4 1/2 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the boot-to-head stage of growth. When applied prior to the boot stage, less desirable control may be obtained. In the fall, apply before plants have turned brown.
13. **Lantana:** Apply this product as a 3/4 to 1 percent solution with hand-held equipment. Apply to actively growing lantana at or beyond the bloom stage of growth. Use the higher application rate for plants that have reached the woody stage of growth.
14. **Loosestrife, purple:** Apply 4 pints of this product per acre as a broadcast spray or as a 1 to 1 1/2 percent solution using hand-held equipment. Treat when plants are actively growing at or beyond the bloom stage of growth. Best results are achieved when application is made during summer or fall months. Fall treatments must be applied before a killing frost.
15. **Lotus, American:** Apply 4 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Treat when plants are actively growing at or beyond the bloom stage of growth. Best results are achieved when application is made during summer or fall months. Fall treatments must be applied before a killing frost. Repeat treatment may be necessary to control regrowth from underground parts and seeds.
16. **Maidencane / Paragrass:** Apply 6 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Repeat treatments will be required, especially to vegetation partially submerged in water. Under these conditions, allow for regrowth to the 7 to 10-leaf stage prior to retreatment.
17. **Milkweed, common:** Apply 4 1/2 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the late bud-to-flower stage of growth.
18. **Nutsedge: purple, yellow:** Apply 4 1/2 pints of this product per acre as a broadcast spray, or as a 3/4 percent solution with hand-held equipment to control existing nutsedge plants and immature nutlets attached to treated plants. Apply when target plants are in flower or when new nutlets can be found at rhizome tips. Nutlets which have not germinated will not be controlled and may germinate following treatment. Repeat treatments will be required for long-term control.
19. **Pampasgrass:** Apply a 1 1/2 percent solution of this product with hand-held equipment when plants are actively growing.
20. **Phragmites:** For partial control of phragmites in Florida and the counties of other states bordering the Gulf of Mexico, apply 7 1/2 pints per acre as a broadcast spray or apply a 1 1/2 percent solution with hand-held equipment. In other areas of the U.S., apply 4 to 6 pints per acre as a broadcast spray or apply a 3/4 percent solution with hand-held equipment for partial control. For best results, treat during late summer or fall months when plants are actively growing and in full bloom. Due to the dense nature of the vegetation, which may prevent good spray coverage and uneven stages of growth, repeat treatments may be necessary to maintain control. Visual control symptoms will be slow to develop.
21. **Quackgrass / Kikuyugrass / Muhly, wirestern:** Apply 3 to 4 1/2 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment when most quackgrass or wirestem muhly is at least 8 inches in height (3 to 4-leaf stage of growth) and actively growing. Allow 3 or more days after application before tillage.
22. **Reed, giant / ice plant:** For control of giant reed and ice plant, apply a 1 1/2 percent solution of this product with hand-held equipment when plants are actively growing. For giant reed, best results are obtained when applications are made in late summer to fall.
23. **Spatterdock:** Apply 6 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Apply when most plants are in full bloom. For best results, apply during the summer or fall months.
24. **Sweet potato, wild:** Apply this product as a 1 1/2 percent solution using hand-held equipment. Apply to actively growing weeds that are at or beyond the bloom stage of growth. Repeat applications will be required. Allow the plant to reach the recommended stage of growth before retreatment.
25. **Thistle, Canada / artichoke:** Apply 3 to 4 1/2 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment for Canada thistle. To control artichoke thistle, apply a 2 percent solution as a spray-to-wet application. Apply when target plants are actively growing and are at or beyond the bud stage of growth.
26. **Torpedograss:** Apply 6 to 7 1/2 pints of this product per acre as a broadcast spray or as a 3/4 to 1 1/2 percent solution with hand-held equipment to provide partial control of torpedograss. Use the lower rates under terrestrial conditions, and the higher rates under partially submerged or a floating mat condition. Repeat treatments will be required to maintain such control.
27. **Tules, common:** Apply this product as a 1 1/2 percent solution with hand-held equipment. Apply to actively growing plants at or beyond the seedhead stage of growth. After application, visual symptoms will be slow to appear and may not occur for 3 or more weeks.
28. **Waterhyacinth:** Apply 5 to 6 pints of this product per acre as a broadcast spray or apply a 3/4 to 1 percent solution with hand-held equipment. Apply when target plants are actively growing and at or beyond the early bloom stage of growth. After application, visual symptoms may require 3 or more weeks to appear with complete necrosis and decomposition usually occurring within 60 to 90 days. Use the higher rates when more rapid visual effects are desired.
29. **Waterlettuce:** For control, apply a 3/4 to 1 percent solution of this product with hand-held equipment to actively growing plants. Use higher rates where infestations are heavy. Best results are obtained from mid-summer through winter applications. Spring applications may require retreatment.
30. **Waterprimrose:** Apply this product as a 3/4 percent solution using hand-held equipment. Apply to plants that are actively growing at or beyond the bloom stage of growth, but before fall color changes occur. Thorough coverage is necessary for best control.
31. **Other perennial weeds listed above:** Apply 4 1/2 to 7 1/2 pints of Glypro per acre as a broadcast spray or apply as a 3/4 to 1 1/2 percent solution with hand-held equipment.

## Woody Brush and Trees

**NOTE:** If brush has been mowed or tilled or trees have been cut, do not treat until regrowth has reached the recommended stage of growth.

**Application Rates and Timing**

When applied as a 5 to 8 percent solution as a directed application as described in the "Hand-Held and High-Volume Equipment" section, this product will control or partially control all wood brush and tree species listed in this section of this label. Use the higher rate of application for dense stands and larger woody brush and trees.

**Specific Brush or Tree Control Recommendations:** Numbers in parentheses "(-)" following the common name of a listed brush or tree species refer to "Specific Brush or Tree Control Recommendations" which follow the species listing. See this section for specific application rates and timing for listed species.

For woody brush and trees, apply the recommended rate plus 2 or more quarts of a nonionic surfactant per 100 gallons of spray solution when plants are actively growing and, unless otherwise directed, after full-leaf expansion. Use the higher rate for larger plants and/or dense areas of growth. On vines, use the higher rate for plants that have reached the woody stage of growth. Best results are obtained when application is made in late summer or fall after fruit formation.

In arid areas, best results are obtained when application is made in the spring or early summer when brush species are at high moisture content and are flowering. Ensure thorough coverage when using hand-held equipment. Symptoms may not appear prior to frost or senescence with fall treatments.

Allow 7 or more days after application before tillage, mowing or removal. Repeat treatments may be necessary to control plants regenerating from underground parts or seed. Some autumn colors on undesirable deciduous species are acceptable provided no major leaf drop has occurred. Reduced performance may result if fall treatments are made following a frost.

See the "Directions for Use" and "Mixing and Application Instructions" sections in this label for labeled use and specific application instructions. **When applied as directed, Glypro plus nonionic surfactant will control the following woody brush plants and trees:** (Numbers in parentheses "(-)" following common name of a listed brush or tree species refer to "Specific Brush or Tree Control Recommendations" for that species which follow the species listing.)

| **Common Name** | **Scientific Name** |
|---|---|
| Alder (1) | *Alnus spp.* |
| Ash† (20) | *Fraxinus spp.* |
| Aspen, quaking (2) | *Populus tremuloides* |
| Bearclover, Bearmat (20) | *Chamaebatia foliolosa* |
| Birch (3) | *Betula spp.* |
| Blackberry (1) | *Rubus spp.* |
| Broom, French (4) | *Cytisus monspessulanus* |
| Broom, Scotch (4) | *Cytisus scoparius* |
| Buckwheat, California† (5) | *Eriogonum fasciculatum* |
| Cascara† (20) | *Rhamnus purshiana* |
| Catsclaw† (6) | *Acacia greggi* |
| Ceanothus (20) | *Ceanothus spp.* |
| Chamise (17) | *Adenostoma fasciculatum* |
| Cherry, bitter (7) | *Prunus emarginata* |
| Cherry, black (7) | *Prunus serotina* |
| Cherry, pin (7) | *Prunus pensylvanica* |
| Coyote brush (8) | *Baccharis consanguinea* |
| Creeper, Virginia† (20) | *Parthenocissus quinquefolia* |
| Dewberry (1) | *Rubus trivialis* |
| Dogwood (9) | *Cornus spp.* |
| Elderberry (3) | *Sambucus spp.* |
| Elm† (20) | *Ulmus spp.* |
| Eucalyptus, bluegum (10) | *Eucalyptus globulus* |
| Hasardia† (5) | *Haplopappus squamosus* |
| Hawthorn (2) | *Crataegus spp.* |
| Hazel (3) | *Corylus spp.* |
| Hickory (9) | *Carya spp.* |
| Holly, Florida (11) (Brazilian peppertree) | *Schinus terebinthifolius* |
| Honeysuckle (1) | *Lonicera spp.* |
| Hornbeam, American (20) | *Carpinus caroliniana* |
| Kudzu (12) | *Pueraria lobata* |
| Locust, black† (20) | *Robinia pseudoacacia* |
| Manzanita (20) | *Arctostaphylos spp.* |
| Maple, red† (13) | *Acer rubrum* |
| Maple, sugar (14) | *Acer saccharum* |
| Maple, vine† (20) | *Acer circinatum* |
| Monkey flower† (5) | *Mimulus guttatus* |
| Oak, black† (20) | *Quercus velutina* |
| Oak, northern pin (14) | *Quercus palustris* |
| Oak, post (1) | *Quercus stellata* |
| Oak, red (14) | *Quercus rubra* |
| Oak, southern red (7) | *Quercus falcata* |
| Oak, white† (20) | *Quercus alba* |
| Persimmon† (20) | *Diospyros spp.* |
| Poison-ivy (15) | *Rhus radicans* |
| Poison-oak (15) | *Rhus toxicodendron* |
| Poplar, yellow† (20) | *Liriodendron tulipifera* |
| Prunus (7) | *Prunus spp.* |
| Raspberry (1) | *Rubus spp.* |
| Redbud, eastern (20) | *Cercis canadensis* |
| Rose, multiflora (16) | *Rosa multiflora* |
| Russian-olive (20) | *Elaeagnus angustifolia* |
| Sage: black (17), white | *Salvia spp.* |
| Sagebrush, California (17) | *Artemisia californica* |
| Salmonberry (3) | *Rubus spectabilis* |
| Salt cedar† (9) | *Tamarix spp.* |
| Saltbush, sea myrtle (18) | *Baccharis halimifolia* |
| Sassafras (20) | *Sassafras aibidum* |
| Sourwood† (20) | *Oxydendrum arboreum* |
| Sumac, poison† (20) | *Rhus vernix* |
| Sumac, smooth† (20) | *Rhus glabra* |
| Sumac, winged† (20) | *Rhus copallina* |
| Sweetgum (7) | *Liquidambar styraciflua* |
| Swordfern† (20) | *Polystichum munitum* |
| Tallowtree, Chinese (17) | *Sapium sebiferum* |
| Thimbleberry (3) | *Rubus parviflorus* |
| Tobacco, tree† (5) | *Nicotiana glauca* |
| Trumpetcreeper (2) | *Campsis radicans* |
| Waxmyrtle, southern† (11) | *Myrica cerifera* |
| Willow (19) | *Salix spp.* |

†Partial control (See below for control or partial control instructions.)

**Specific Brush or Tree Control Recommendations:**

1. **Alder / Blackberry / Dewberry / Honeysuckle / Oak, Post / Raspberry:** For control, apply 4 1/2 to 6 pints per acre as a broadcast spray or as a 3/4 to 1 1/4 percent solution with hand-held equipment.
2. **Aspen, Quaking / Hawthorn / Trumpetcreeper:** For control, apply 3 to 4 1/4 pints of this product per acre as a broadcast spray or as a 3/4 to 1 1/4 percent solution with hand-held equipment.
3. **Birch / Elderberry / Hazel / Salmonberry / Thimbleberry:** For control, apply 3 pints per acre of this product as a broadcast spray or as a 3/4 percent solution with hand-held equipment.
4. **Broom, French / Broom, Scotch:** For control, apply a 1 1/4 to 1 1/2 percent solution with hand-held equipment.
5. **Buckwheat, California / Hasardia / Monkey flower / Tobacco, tree:** For partial control of these species, apply a 3/4 to

1 1/2 percent solution of this product as a foliar spray with hand-held equipment. Thorough coverage of foliage is necessary for best results.

6. **Catsclaw:** For partial control, apply a 1 1/4 to 1 1/2 percent solution with hand-held equipment when at least 50 percent of the new leaves are fully developed.
7. **Cherry, bitter / Cherry, black / Cherry, pin / Oak, southern red / Sweetgum / Prunus:** For control, apply 3 to 7 1/2 pints of this product per acre as a broadcast spray or as a 1 to 1 1/2 percent solution with hand-held equipment.
8. **Coyote brush:** For control, apply a 1 1/4 to 1 1/2 percent solution with hand-held equipment when at least 50 percent of the new leaves are fully developed.
9. **Dogwood / Hickory / Salt cedar:** For partial control, apply a 1 to 2 percent solution of this product with hand-held equipment or 6 to 7 1/2 pints per acre as a broadcast spray.
10. **Eucalyptus, bluegum:** For control of eucalyptus resprouts, apply a 1 1/2 percent solution of this product with hand-held equipment when resprouts are 6 to 12-feet tall. Ensure complete coverage. Apply when plants are actively growing. Avoid application to drought-stressed plants.
11. **Holly, Florida / Waxmyrtle, southern:** For partial control, apply this product as a 1 1/2 percent solution with hand-held equipment.
12. **Kudzu:** For control, apply 6 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Repeat applications will be required to maintain control.
13. **Maple, red:** For control, apply as a 3/4 to 1 1/4 percent solution with hand-held equipment when leaves are fully developed. For partial control, apply 2 to 7 1/2 pints of this product per acre as a broadcast spray.
14. **Maple, sugar / Oak: northern pin / Oak, red:** For control, apply as a 3/4 to 1¼ percent solution with hand-held equipment when at least 50 percent of the new leaves are fully developed.
15. **Poison-ivy / Poison-oak:** For control, apply 6 to 7 1/2 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Repeat applications may be required to maintain control. Fall treatments must be applied before leaves lose green color.
16. **Rose, multiflora:** For control, apply 3 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Treatments should be made prior to leaf deterioration by leaf-feeding insects.
17. **Sage, black / Sagebrush, California / Chamise / Tallowtree, Chinese:** For control of these species, apply a 3/4 percent solution of this product as a foliar spray with hand-held equipment. Thorough coverage of foliage is necessary for best results.
18. **Saltbush, sea myrtle:** For control, apply this product as a 1 percent solution with hand-held equipment.
19. **Willow:** For control, apply 4 1/2 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment.
20. **Other woody brush and trees listed above:** For partial control, apply 3 to 7 1/2 pints of this product per acre as a broadcast spray or as a 3/4 to 1 1/2 percent solution with hand-held equipment.

## Aquatic and other Noncrop Sites

Apply Glypro as directed and under conditions described to control or partially control weeds and woody plants listed in the "Weeds Controlled" section in industrial, recreational and public areas or other similar aquatic or terrestrial sites on this label.

### Noncrop Sites

**Glypro may be used to control the listed weeds in the following terrestrial noncrop sites and/or in aquatic sites within these areas:**

Airports
Golf Courses
Habitat Restoration & Management Areas
Highways & Roadsides
Industrial Plant Sites
Lumberyards
Parking Areas
Parks
Petroleum Tank Farms
Pipeline, Power, Telephone & Utility Rights-of-Way
Pumping Installations
Railroads
Schools
Storage Areas
Similar Sites

### Aquatic Sites

**Glypro may be applied to emerged weeds in all bodies of fresh and brackish water which may be flowing, nonflowing or transient. This includes lakes, rivers, streams, ponds, estuaries, rice levees, seeps, irrigation and drainage ditches, canals, reservoirs, wastewater treatment facilities, wildlife habitat restoration and management areas, and similar sites.**

**If aquatic sites are present in the noncrop area and are part of the intended treatment, read and observe the following directions:**

- **Glypro does not control plants which are completely submerged or have a majority of their foliage under water.**
- There is no restriction on the use of treated water for irrigation, recreation or domestic purposes.
- Consult local state fish and game agency and water control authorities before applying this product to public water. Permits may be required to treat such water.
- **NOTE:** Do not apply this product directly to water within 1/2 mile upstream of an active potable water intake in flowing water (i.e., river, stream, etc.) or within 1/2 mile of an active potable water intake in a standing body of water such as lake, pond or reservoir. To make aquatic applications around and within 1/2 mile of active potable water intakes, the water intake must be turned off for a minimum period of 48 hours after the application. The water intake may be turned on prior to 48 hours if the glyphosate level in the intake water is below 0.7 parts per million as determined by laboratory analysis. These aquatic applications may be made **only** in those cases where there are alternative water sources or holding ponds which would permit the turning off of an active potable water intake for a minimum period of 48 hours after the applications. This restriction does not apply to intermittent inadvertent overspray of water in terrestrial use sites.
- For treatments after drawdown of water or in dry ditches, allow 7 or more days after treatment before reintroduction of water to achieve maximum weed control. Apply this product within 1 day after drawdown to ensure application to actively growing weeds.

- Floating mats of vegetation may require retreatment. Avoid wash-off of sprayed foliage by spray boat or recreational boat backwash or by rainfall within 6 hours of application. Do not re-treat within 24 hours following the initial treatment.
- Applications made to moving bodies of water must be made while traveling upstream to prevent concentration of this herbicide in water. When making any bankside applications, do not overlap more than 1 foot into open water. Do not spray in bodies of water where weeds do not exist. The maximum application rate of 7 1/2 pints per acre must not be exceeded in any single broadcast application that is being made over water.
- When emerged infestations require treatment of the total surface area of impounded water, treating the area in strips may avoid oxygen depletion due to decaying vegetation. Oxygen depletion may result in fish kill.

## Forestry Site Preparation and Utility Rights-of-Way

In forest and utility sites, Glypro is recommended for the control or partial control of woody brush, trees, and annual and perennial herbaceous weeds. Glypro is also recommended for use in preparing or establishing wildlife openings within these sites and for maintaining logging roads, and for side trimming along utility rights-of-way.

In forestry sites, Glypro is recommended for use in site preparation prior to planting any tree species, including Christmas trees and silvicultural nursery sites.

In utility sites, Glypro is recommended for use along electrical power, pipeline, and telephone rights-of-way, and in other utility sites associated with these rights-of-way, such as substations.

**Application Rates[†]:**

| Method of Application | Application Rate | Spray Volume (gal/acre) |
|---|---|---|
| **Broadcast** | | |
| Aerial | 1 1/2 to 7 1/2 qt/acre | 5 to 30 |
| Ground | 1.5 to 7.5 qt/acre | 10 to 60 |
| **Spray-to-Wet** | | |
| Handgun, Backpack Mistblower | 0.75 to 2% by volume | spray-to-wet |
| **Low Volume Directed Spray[††]** Handgun, Backpack Mistblower | 5% to 10% by volume | partial coverage |

[†] Where repeat applications are necessary, do not exceed 8.0 quarts per acre per year.

[††] For low volume directed spray applications, coverage should be uniform with at least 50 percent of the foliage contacted. For best results, coverage of the top one-half of the plant is important.

In forestry site preparation and utility rights-of-way applications, Glypro requires use with a nonionic surfactant. Use a nonionic surfactant containing greater than 80 percent active ingredient and labeled for use with herbicides. Use of this product without surfactant will result in reduced herbicidal performance. Refer to the "Mixing and Application Instructions" section of this label for more information.

Mix 2 or more quarts of nonionic surfactant per 100 gallons of spray solution (0.5% or more by volume). Use of surfactant concentrations greater than 1.5% by volume with handgun applications or 2.5% by volume with broadcast applications is not recommended.

Use higher rates of Glypro within the recommended rate ranges for control or partial control of woody brush, trees and hard-to-control perennial herbaceous weeds. For best results, apply to actively growing woody brush and trees after full leaf expansion and before fall color and leaf drop. Use increased rates within the recommended rate range to control of perennial herbaceous weeds from emergence up to the appearance of seedheads, flowers or berries appear. Use lower rates within the recommended rate range to control annual herbaceous weeds and actively growing perennial herbaceous weeds after seedheads, flowers or berries appear. Apply to foliage of actively growing annual herbaceous weeds anytime after emergence.

**Tank Mixtures**

Glypro may be used in tank mix combination with other herbicide products to broaden the spectrum of vegetation controlled. When tank mixing, read and observe applicable use directions, precautions and limitations on the respective product labels. Use according to the most restrictive precautionary statements for each product on the mixture. Any recommended rate of Glypro may be used in a tank mix.

**Note:** For forestry site preparation, make sure the tank mix product is approved for use prior to planting the desired species. Observe planting interval restrictions. For side trimming treatments in utility rights-of-way, tank mixtures with Arsenal 2WSL herbicide are not recommended. For side trimming treatments, it is recommended that this product be used alone as recommended, or as a tank mix with Garlon.

| Product | Broadcast Rate | Use Sites |
|---|---|---|
| Arsenal Applicators Concentrate | 2 to 16 fl oz/acre | Forestry site preparation |
| Oust | 1 to 4 oz/acre | Forestry site preparation, utility sites |
| Garlon 3A [†] | 1 to 4 qt/acre | Forestry site preparation, utility sites |
| Garlon 4 | 1 to 4 qt/acre | Forestry site preparation, utility sites |
| Arsenal 2WSL | 2 to 32 fl oz/acre | Utility sites |
| | **Spray-to-Wet Rates** | |
| Arsenal Applicators Concentrate | 1/32% to 1/2% by volume | Forestry site preparation |
| Arsenal 2WSL | 1/32% to 1/2% by volume | Utility sites |
| | **Low Volume Directed Spray Rates** | |
| Arsenal Applicators Concentrate | 1/8% to 1/2% by volume | Forestry site preparation |
| Arsenal 2WSL | 1/8% to 1/2% by volume | Utility sites |

[†] Ensure that Garlon 3A is thoroughly mixed with water before adding Glypro. Agitation is required while mixing Glypro with Garlon 3A to avoid compatibility problems.

For control of herbaceous weeds, use the lower recommended tank mixture rates. For control of dense stands or difficult-to-control woody brush and trees, use the higher recommended rates.

## Forestry Conifer and Hardwood Release

### Directed Sprays and Selective Equipment

Glypro may be applied as a directed spray or by using selective equipment in forestry conifer and hardwood sites, including Christmas tree plantations and silvicultural nurseries. Mix 2 to 6 quarts of a nonionic surfactant per 100 gallons of spray solution (0.5 to 1.5 percent by volume) for all spray applications. Use a surfactant with greater than 80 percent active ingredient.

**Tank Mixing:** In hardwood plantations, tank mixtures with Oust may be used. In pine plantations, tank mixtures with Garlon 4 or Arsenal AC may be used. Comply with all site restrictions, forestry species limitations, and precautions on the tank mix product labels.

Avoid contact of spray drift, mist or drips with foliage, green bark or non-woody surface roots of desirable plant species. See "Application Equipment and Techniques" section of this label for specific recommendations and precautions.

**Spray-to-Wet Applications:** Use a 2 percent spray solution to control undesirable woody brush and trees. To control herbaceous weeds, use a 1 to 2 percent spray solution.

**Low Volume Directed Spray Applications:** Use a 5 to 10 percent spray solution. Coverage should be uniform with at least 50 percent of the foliage contacted. Coverage of the top one-half of the unwanted vegetation is important.

**Broadcast Applications:** For equipment calibrated for broadcast applications, use 1 1/2 to 7 1/2 quarts of Glypro per acre. Apply in 10 to 60 gallons of clean water per acre. Shielded application equipment may be used to avoid contact of the spray solution with desirable plants. Shields should be adjusted to prevent spray contact with the foliage of green bark of desirable vegetation.

**Wiper Application Equipment:** See the "Selective Equipment" section of this label for equipment and application rate recommendations.

### Broadcast Application

**Note:** Except where specifically recommended below, make broadcast applications of Glypro only where conifers have been established for more than one year.

**Broadcast application must be made after formation of final conifer resting buds in the fall or prior to initial bud swelling in the spring.**

Injury may occur to conifers treated for release, especially where spray patterns overlap or the higher rates are applied. Damage can be accentuated if applications are made when conifers are actively growing, or are under stress from drought, flood water, improper planting, insects, animal damage or diseases.

Glypro may require use with a surfactant. Use a nonionic surfactant recommended for over-the-top foliar spray at the recommended labeled rate. Follow the instructions under "Mixing" portion of the "Mixing and Applications" section of this label.

**For release of the following conifer species outside the Southeastern United States:**

**Douglas fir** (*Pseudotsuga menziesii*)
**Fir** (*Abies* species)
**Hemlock**†† (*Tsuga* species)
**Pines**† (*Pinus* species)
**Redwood, California**†† (*Sequoia* species)

† Includes all species except loblolly pine, longleaf pine, shortleaf pine or slash pine.
†† Use of a surfactant is not recommended for release of hemlock species or California redwood. In mixed conifer stands, injury to these species may result if a surfactant is used.

**Application Rate for Conifer Release:** Apply 3/4 to 1 1/2 quarts per acre as a broadcast spray. In Maine, up to 2 1/4 quarts per acre of Glypro may be used for the control of difficult-to-control species.

To release Douglas fir, and pine and spruce species at the end of the first growing season (except in California), apply 3/4 to 1 1/8 quarts per acre of Glypro. Make sure that all conifers are well hardened off.

**Note:** For release of Douglas fir with Glypro or recommended tank mixtures, a nonionic surfactant recommended for over-the-top foliar spray may be used. To avoid possible conifer injury, nonionic surfactants may be used at 2 fluid ounces per acre at elevations above 1500 feet, or 1 fluid ounce per acre in the coastal range or at elevations below 1500 feet. Use of surfactant rates exceeding those listed above may result in unacceptable conifer injury and are not recommended. Make sure that the nonionic surfactant has been adequately tested for safety to Douglas fir before use.

**Tank Mixtures with Oust :** To release jack pine, white pine and white spruce, apply 3/4 to 1 1/2 quarts of Glypro with 1 to 3 ounces (1 to 1 1/2 for white pine) of Oust per acre. Make applications to actively growing weeds as a broadcast spray over the top of established conifers. Applications at these rates should be make after formation of conifer resting buds in the late summer or fall.

**Tank Mixtures with Arsenal Applicators Concentrate:** Glypro may be tank mixed with Arsenal Applicators Concentrate for release of Douglas fir. Tank mix 3/4 to 1 1/8 quarts of Glypro with 2 to 6 fluid ounces of Arsenal Applicators Concentrate per acre. For release of balsam fir and red spruce, apply a mixture of 1 1/2 quarts of Glypro with 1 to 2 1/2 fluid ounces of Arsenal Applicators Concentrate per acre.

**For release of the following conifer species in the Southeastern United States:**

**Loblolly pine** (*Pinus taeda*)
**Eastern white pine** (*Pinus strobus*)
**Shortleaf pine** (*Pinus echinata*)
**Slash pine** (*Pinus elliottii*)
**Virginia pine** (*Pinus virginiana*)
**Longleaf pine** (*Pinus palustris*)

Apply 1 1/8 to 1 7/8 quarts of Glypro per acre as a broadcast spray during late summer or early fall after the conifers have hardened off. For applications at the end of the first growing season, use 3/4 quart of Glypro alone or in a recommended tank mixture.

**Tank Mixtures with Arsenal Applicators Concentrate:** For conifer release, apply 3/4 to 1 1/2 quarts of Glypro with 2 to 16 fluid ounces of Arsenal Applicators Concentrate per acre as a broadcast spray. Use only on conifer species that are labeled for over-the-top spray for both products. Use the higher recommended rates for dense tough-to-control wood brush and trees.

Read and observe label claims, cautionary statements and all information on the labels of each product used in these tank mixtures. Use according to the most restrictive precautionary statements for each product in the mixture.

### Herbaceous Release

When applied as directed, Glypro plus listed residual herbicides provides postemergence control of the annual weeds and control or suppression of the perennial weeds listed in this label, and residual control of the weeds listed in the residual herbicide label. Make applications to actively growing weeds as a broadcast spray over the top of labeled conifers.

**Tank Mixtures with Oust:** To release loblolly pines, tank mix 12 to 18 fluid ounces of Glypro with 2 to 4 ounces of Oust per acre.

To release slash pines, tank mix 9 to 12 fluid ounces of Glypro with 2 to 4 ounces of Oust per acre.

Mix up to 3.2 fluid ounces per acre of Entry II or equivalent surfactant with the recommended rate of Glypro plus Oust. Applications can be made over newly planted pines after emergence of herbaceous weeds in the spring or early summer. Best results are obtained from applications made in May and June.

Weed control may be reduced if water volumes exceed 25 gallons per acre for these treatments.

**Tank Mixture with Atrazine:** To release Douglas fir, apply 3/4 quart of Glypro with 4 pounds a.i. of atrazine per acre. Apply only over Douglas fir that has been established for at least one full growing season. Apply in the early spring, usually mid-March through early April. Injury will occur if applications are made after bud swell in the spring. For this use, do not add surfactant to the tank mixture.

Always read and follow the manufacturer's label for all herbicides and surfactants used.

## Wetland Sites

Glypro may be used in and around water (aquatic areas) and wetlands found in forestry and in power, telephone and pipeline rights-of-way sites, including where these sites are adjacent to or surrounding domestic water supply reservoirs, supply streams, lakes and ponds. Read and observe the following before making applications in and around water.

Consult local public water control authorities before applying Glypro in and around public water. Permits may be required to treat in such areas.

There is not restriction on the use of treated water for irrigation, recreation or domestic purposes.

**Note:** Do not apply this product directly to water within 1/2 mile upstream of an active potable water intake in flowing water (i.e., river, stream, etc.) or within 1/2 mile of an active potable water intake in a standing body of water such as a lake, pond or reservoir. To make aquatic applications around and within 1/2 mile of active potable water intakes, the water intake must be turned off for a minimum period of 48 hours after application. These aquatic applications may be made ONLY in those cases where there are alternative water sources or holding ponds which would permit the turning off of an active potable water intake for a minimum period of 48 hours after the application. This restriction does not apply to intermittent inadvertent overspray of water in terrestrial use sites.

Do not spray open bodies of water where woody brush, trees and herbaceous weeds do not exist. The maximum application rate of 3 3/4 quarts per acre must not be exceeded in a single over-water broadcast application except as follows, where any recommended rate may be applied:

- Stream crossings in utility right-of-way.
- Where applications will result in less than 20 percent of the total water area being treated.

## Wildlife Habitat Restoration and Management Areas

Glypro is recommended for the restoration and/or maintenance of native habitat and in wildlife management areas.

**Habitat Restoration and Maintenance:** When applied as directed, exotic and other undesirable vegetation may be controlled in habitat management areas. Applications may be made to allow recovery of native plant species, to open up water to attract waterfowl, and for similar broad-spectrum vegetation control requirements in habitat management areas. Spot treatments may be made to selectively remove unwanted plants for habitat enhancement. For spot treatments, care should be exercised to keep spray off of desirable plants.

**Wildlife Food Plots:** Glypro may be used as a site preparation treatment prior to planting wildlife food plots. Apply as directed to control vegetation in the plot area. Any wildlife food species may be planted after applying this product, or native species may be allowed to reinfest the area. If tillage is needed to prepare a seedbed, wait 7 days after applying this product before tilling to allow for maximum effectiveness.

## Wiper Applications

For wick or wiper applications, mix 1 gallon of this product with 2 gallons of clean water to make a 33 percent solution. Addition of a nonionic surfactant at a rate of 10 percent by volume of total herbicide solution is recommended.

Wiper applications can be used to control or suppress annual and perennial weeds listed on this label. In heavy weed stands, a double application in opposite directions may improve results. See the "Weed Controlled" section in this label for recommended timing, growth stage and other instructions for achieving optimum results

## Cut Stump Application

Woody vegetation may be controlled by treating freshly cut stumps of trees and resprouts with this product. Apply this product using suitable equipment to ensure coverage of the entire cambium. Cut vegetation close to the soil surface. **Apply a 50 to 100 percent solution of this product to freshly cut surface immediately after cutting.** Delay in applying this product may result in reduced performance. For best results, trees should be cut during periods of active growth and full leaf expansion.

When used according to directions for cut stump application, this product will **control**, **partially control or suppress** most woody brush and tree species, some of which are listed below:

| **Common Name** | **Scientific Name** |
|---|---|
| Alder | *Alnus spp.* |
| Coyote brush† | *Baccharis consanguinea* |
| Dogwood† | *Cornus spp.* |
| Eucalyptus | *Eucalyptus spp.* |
| Hickory† | *Carya spp.* |
| Madrone | *Arbutus menziesii* |
| Maple† | *Acer spp.* |
| Oak | *Quercus spp.* |
| Poplar† | *Populus spp.* |
| Reed, giant | *Arundo donax* |
| Salt cedar | *Tamarix spp.* |
| Sweet gum† | *Liquidambar styraciflua* |
| Sycamore† | *Platanus occidentalis* |
| Tan oak | *Lithocarpus densiflorus* |
| Willow | *Salix spp.* |

†Glypro is not approved for this use on these species in the state of California.

## Injection and Frill Applications

Woody vegetation may be controlled by injection or frill application of this product. Apply this product using suitable equipment which must penetrate into living tissue. Apply the equivalent of 1 ml of this product per 2 to 3 inches of trunk diameter. This is best achieved by applying 25 to 100 percent concentration of this product either to a continuous frill around the tree or as cuts evenly spaced around the tree below all branches. As tree diameter increases in size, better results are achieved by applying dilute material to a continuous frill or more closely spaced cuttings. Avoid application techniques that allow runoff to occur from frill or cut areas in species that exude sap freely after frills or cutting. In species such as these, make frill or cut at an oblique angle so as to produce a cupping effect and use undiluted material. For best results, applications should be made during periods of active growth and full leaf expansion.

**This treatment will control the following woody species:**

| **Common Name** | **Scientific Name** |
|---|---|
| Oak | *Quercus spp.* |
| Poplar | *Populus spp.* |
| Sweet gum | *Liquidambar styraciflua* |
| Sycamore | *Platanus occidentalis* |

**This treatment will suppress the following woody species:**

| **Common Name** | **Scientific Name** |
|---|---|
| Black gum† | *Nyssa sylvatica* |
| Dogwood | *Cornus spp.* |
| Hickory | *Carya spp.* |
| Maple, red | *Acer rubrum* |

†Glypro is not approved for this use on this species in the state of California.

## Release of Bermudagrass or Bahiagrass on Noncrop Sites

### Release Of Dormant Bermudagrass And Bahiagrass

When applied as directed, this product will provide control or suppression of many winter annual weeds and tall fescue for effective release of dormant bermudagrass or bahiagrass. Make applications to dormant bermudagrass or bahiagrass.

For best results on winter annuals, treat when weeds are in an early growth stage (below 6 inches in height) after most have germinated. For best results on tall fescue, treat when fescue is in or beyond the 4 to 6-leaf stage.

### Weeds Controlled

Rate recommendations for control or suppression of winter annuals and tall fescue are listed below.

Apply the recommended rates of this product in 10 to 25 gallons of water per acre plus 2 quarts nonionic surfactant per 100 gallons of total spray volume.

**Weeds Controlled or Suppressed**[†]

**Note:** C = Controlled; S = Suppressed

| Weed Species | Rate of Glypro (Fluid Ounces Per Acre) | | | | | |
|---|---|---|---|---|---|---|
| | **6** | **9** | **12** | **18** | **24** | **48** |
| **Barley, little** *Hordeum pusillum* | S | C | C | C | C | C |
| **Bedstraw, catchweed** *Galium aparine* | S | C | C | C | C | C |
| **Bluegrass, annual** *Poa annua* | S | C | C | C | C | C |
| **Chervil** *Chaerophyllum tainturieri* | S | C | C | C | C | C |
| **Chickweed, common** *Stellaria media* | S | C | C | C | C | |
| **Clover, crimson** *Trifolium incarnatum* | • | S | S | C | C | C |
| **Clover, large hop** *Trifolium campestre* | • | S | S | C | C | C |
| **Speedwell, corn** *Veronica arvensis* | S | C | C | C | C | C |
| **Fescue, tall** *Festuca arundinacea* | • | • | • | • | S | S |
| **Geranium, Carolina** *Geranium carolinianum* | • | • | S | S | C | C |
| **Henbit** *Lamium amplexicaule* | • | S | C | C | C | C |
| **Ryegrass, Italian** *Lolium multiflorum* | • | • | S | C | C | C |
| **Vetch, common** *Vicia sativa* | • | • | S | C | C | C |

[†]These rates apply only to sites where an established competitive turf is present.

## Release Of Actively Growing Bermudagrass

**NOTE: Use only on sites where bahiagrass or bermudagrass are desired for ground cover and some temporary injury or yellowing of the grasses can be tolerated.**

When applied as directed, this product will aid in the release of bermudagrass by providing control of annual species listed in the "Weeds Controlled" section in this label, and suppression or partial control of certain perennial weeds.

For control or suppression of those annual species listed in this label, use 3/4 to 2 1/4 pints of this product as a broadcast spray in 10 to 25 gallons of spray solution per acre, plus 2 quarts of a nonionic surfactant per 100 gallons of total spray volume. Use the lower rate when treating annual weeds below 6 inches in height (or length of runner in annual vines). Use the higher rate as size of plants increases or as they approach flower or seedhead formation.

Use the higher rate for partial control or longer-term suppression of the following perennial species. Use lower rates for shorter-term suppression of growth.

| | |
|---|---|
| Bahiagrass | Johnsongrass[†] |
| Dallisgrass | Trumpetcreeper[††] |
| Fescue (tall) | Vaseygrass |

[†]Johnsongrass is controlled at the higher rate.
[††]Suppression at the higher rate only.

Use only on well-established bermudagrass. Bermudagrass injury may result from the treatment but regrowth will occur under moist conditions. Repeat applications in the same season are not recommended, since severe injury may result.

## Bahiagrass Seedhead and Vegetative Suppression

When applied as directed in the "Noncrop Sites" section in this label, this product will provide significant inhibition of seedhead emergence and will suppress vegetative growth for a period of approximately 45 days with single applications and approximately 120 days with sequential applications.

Apply this product 1 to 2 weeks after full green-up of bahiagrass or after the bahiagrass has been mowed to a uniform height of 3 to 4 inches. Applications must be made prior to seedhead emergence. Apply 5 fluid ounces per acre of this product, plus 2 quarts of an approved nonionic surfactant per 100 gallons of total spray volume in 10 to 25 gallons of water per acre.

Sequential applications of this product plus nonionic surfactant may be made at approximately 45-day intervals to extend the period of seedhead and vegetative growth suppression. For continued vegetative growth suppression, sequential applications must be made prior to seedhead emergence.

Apply no more than 2 sequential applications per year. As a first sequential application, apply 3 fluid ounces of this product per acre plus nonionic surfactant. A second sequential application of 2 to 3 fluid ounces per acre plus nonionic surfactant may be made approximately 45 days after the last application.

## Annual Grass Growth Suppression

For growth suppression of some annual grasses, such as annual ryegrass, wild barley and wild oats growing in coarse turf on roadsides or other industrial areas, apply 3 to 4 ounces of this product in 10 to 40 gallons of spray solution per acre. Mix 2 quarts of a nonionic surfactant per 100 gallons of spray solution. Applications should be made when annual grasses are actively growing and before the seedheads are in the boot stage of development. Treatments made after seedhead emergence may cause injury to the desired grasses.

## Warranty Disclaimer

Dow AgroSciences warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes stated on the label when used in strict accordance with the directions, subject to the inherent risks set forth below. Dow AgroSciences MAKES NO OTHER EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER EXPRESS OR IMPLIED WARRANTY.

## Inherent Risks of Use

It is impossible to eliminate all risks associated with use of this product. Plant injury, lack of performance, or other unintended consequences may result because of such factors as use of the product contrary to label instructions (including conditions noted on the label, such as unfavorable temperature, soil conditions, etc.), abnormal conditions (such as excessive rainfall, drought, tornadoes, hurricanes), presence of other materials, the manner of application, or other factors, all of which are beyond the control of Dow AgroSciences or the seller. All such risks shall be assumed by buyer.

## Limitation of Remedies

The exclusive remedy for losses or damages resulting from this product (including claims based on contract, negligence, strict liability, or other legal theories), shall be limited to, at Dow AgroSciences' election, one of the following:

1. Refund of purchase price paid by buyer or user for product bought, or
2. Replacement of amount of product used

Dow AgroSciences shall not be liable for losses or damages resulting from handling or use of this product unless Dow AgroSciences is promptly notified of such loss or damage in writing. In no case shall Dow AgroSciences be liable for consequential or incidental damages or losses.

The terms of the "Warranty Disclaimer" above and this "Limitation of Remedies" cannot be varied by any written or verbal statements or agreements. No employee or sales agent of Dow AgroSciences or the seller is authorized to vary or exceed the terms of the "Warranty Disclaimer" or this "Limitation of Remedies" in any manner.

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**Dow AgroSciences LLC • Indianapolis, IN 46268 U.S.A.**

Label Code: D02-077-002
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EPA-accepted 07/15/99

**Revisions:**

Initial Printing

# MATERIAL SAFETY DATA SHEET

**Emergency Phone: 800-992-5994**
**Dow AgroSciences LLC**
**Indianapolis, IN 46268**

## GLYPRO* HERBICIDE

Effective Date: 3/23/04
Product Code: 74370
MSDS: 006694

### 1. PRODUCT AND COMPANY IDENTIFICATION:

**PRODUCT:** Glypro* Herbicide

**COMPANY IDENTIFICATION:**
Dow AgroSciences LLC
9330 Zionsville Road
Indianapolis, IN 46268-1189

### 2. COMPOSITION/INFORMATION ON INGREDIENTS:

| | | |
|---|---|---|
| Glyphosate IPA: N-(phosphono-methyl) glycine, Isopropylamine Salt | CAS # 038641-94-0 | 53.8% |
| Balance, Total | | 46.2% |

### 3. HAZARDOUS IDENTIFICATIONS:

**EMERGENCY OVERVIEW**
Clear, pale yellow liquid. May cause eye irritation. Slightly toxic to aquatic organisms.
**EMERGENCY PHONE NUMBER:** 800-992-5994

### 4. FIRST AID:

**EYE**: Flush eyes thoroughly with water for several minutes. Remove contact lenses after initial 1-2 minutes and continue flushing for several additional minutes. If effects occur, consult a physician, preferably an ophthalmologist.

**SKIN**: Wash skin with plenty of water.

**INGESTION:** No emergency medical treatment necessary.

**INHALATION**: Remove person to fresh air; if effects occur, consult a physician.

**NOTE TO PHYSICIAN**: No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

### 5. FIRE FIGHTING MEASURES:

**FLASH POINT:** >214$^{o}$F (>101$^{o}$C)
**METHOD USED:** Setaflash

**FLAMMABLE LIMITS:**
LFL: Not applicable
UFL: Not applicable

**EXTINGUISHING MEDIA:** Foam, $CO_2$, Dry Chemical

**FIRE AND EXPLOSION HAZARDS**: Foam fire extinguishing system is preferred because uncontrolled water can spread possible contamination. Toxic irritating gases may be formed under fire conditions.

**FIRE-FIGHTING EQUIPMENT:** Use positive-pressure, self-contained breathing apparatus and full protective equipment.

### 6. ACCIDENTAL RELEASE MEASURES:

**ACTION TO TAKE FOR SPILLS:** Absorb small spills with an inert absorbent material such as Hazorb, Zorball, sand, or dirt. Report large spills to Dow AgroSciences on 800-992-5994.

### 7. HANDLING AND STORAGE:

**PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:** Keep out of reach of children. Do not swallow. Avoid contact with eyes, skin, and clothing. Avoid breathing vapors and spray mist. Handle concentrate in ventilated area. Wash thoroughly with soap and water after handling and before eating, chewing gum, using tobacco, using the toilet or smoking. Keep away from food, feedstuffs, and water supplies. Store in original container with the lid tightly closed. Store above 10$^{o}$F (-12$^{o}$C) to keep from crystallizing.

### 8. EXPOSURE CONTROLS/PERSONAL PROTECTION:

These precautions are suggested for conditions where the potential for exposure exists. Emergency conditions may require additional precautions.

**EXPOSURE GUIDELINES**: None established

**ENGINEERING CONTROLS**: Good general ventilation should be sufficient for most conditions. Local exhaust ventilation may be necessary for some operations.

**RECOMMENDATIONS FOR MANUFACTURING, COMMERCIAL BLENDING, AND PACKAGING WORKERS:**

**EYE/FACE PROTECTION**: Use safety glasses.

**SKIN PROTECTION:** No precautions other than clean body-covering clothing should be needed.


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**RESPIRATORY PROTECTION**: For most conditions, no respiratory protection should be needed; however, if discomfort is experienced, use a NIOSH approved air-purifying respirator.

**APPLICATIONS AND ALL OTHER HANDLERS**: Please refer to the product label for personal protective clothing and equipment.

### 9. PHYSICAL AND CHEMICAL PROPERTIES:

**APPEARANCE:** Clear, pale yellow liquid
**DENSITY:** 10.0 - 10.5 lbs/gal
**pH:** 4.8 – 5.0
**ODOR**: None
**SOLUBILITY IN WATER:** Miscible
**SPECIFIC GRAVITY:** 1.21 gm/L
**FREEZING POINT**: -7°F - -10°F (-21°C - -25°C)

### 10. STABILITY AND REACTIVITY:

**STABILITY:** (CONDITIONS TO AVOID) Stable under normal storage conditions.

**INCOMPATIBILITY:** (SPECIFIC MATERIALS TO AVOID) Galvanized or unlined steel (except stainless steel) containers or spray tanks may produce hydrogen gas which may form a highly combustible gas mixture.

**HAZARDOUS DECOMPOSITION PRODUCTS**: None known.

**HAZARDOUS POLYMERIZATION:** Not known to occur.

### 11. TOXICOLOGICAL INFORMATION:

**EYE:** May cause slight temporary eye irritation. Corneal injury is unlikely.

**SKIN:** Essentially non-irritating to skin. Prolonged skin contact is unlikely to result in absorption of harmful amounts. The $LD_{50}$ for skin absorption in rabbits is >5000 mg/kg. Did not cause allergic skin reactions when tested in guinea pigs.

**INGESTION:** Very low toxicity if swallowed. Harmful effects not anticipated from swallowing small amounts. The oral $LD_{50}$ for rats is >5000 mg/kg.

**INHALATION:** Brief exposure (minutes) is not likely to cause adverse effects. The aerosol $LC_{50}$ for rats is >6.37 mg/L for 4 hours.

**SYSTEMIC (OTHER TARGET ORGAN) EFFECTS**: For a similar material, glyphosate, in animals, effects have been reported on the following organ: liver.

**CANCER INFORMATION**: A similar material, glyphosate, did not cause cancer in laboratory animals.

**TERATOLOGY (BIRTH DEFECTS):** For glyphosate IPA, available data are inadequate for evaluation of potential to cause birth defects.

**REPRODUCTIVE EFFECTS**: For glyphosate IPA, available data are inadequate to determine effects on reproduction.

**MUTAGENICITY:** For a similar material, glyphosate, in-vitro and animal genetic toxicity studies were negative.

### 12. ECOLOGICAL INFORMATION:

**ENVIRONMENTAL DATA:**

**ECOTOXICOLOGY**:
Material is practically non-toxic to aquatic organisms on an acute basis ($LC_{50}$ or $EC_{50}$ is >100 mg/L in most sensitive species tested).
Acute $LC_{50}$ for rainbow trout *(Oncorhynchus mykiss)* is >2500 mg/L.
Acute immobilization $EC_{50}$ in water flea *(Daphnia magna)* is 918 mg/L.
Material is practically non-toxic to birds on an acute basis ($LD_{50}$ is >2000 mg/kg).
Acute oral $LD_{50}$ in bobwhite *(Colinus virginianus)* is >2000 mg/kg.
The $LC_{50}$ in earthworm Eisenia foetida is >1000 mg/kg.
Acute contact $LD_{50}$ in honey bee *(Apis mellifera)* is >100 µg/bee.
Acute oral $LD_{50}$ in honey bee *(Apis mellifera)* is >100 µg/bee.
Growth inhibition $EC_{50}$ in green alga *(Selenastrum capricornutum)* is 127 mg/L.
Growth inhibition $EC_{50}$ in duckweed *(Lemna sp.)* is 24.4 mg/L.

### 13. DISPOSAL CONSIDERATIONS:

**DISPOSAL METHOD:** If wastes and/or containers cannot be disposed of according to the product label directions, disposal of this material must be in accordance with your local or area regulatory authorities.

# MATERIAL SAFETY DATA SHEET

**Emergency Phone: 800-992-5994**
**Dow AgroSciences LLC**
**Indianapolis, IN 46268**

## GLYPRO* HERBICIDE

Effective Date: 3/23/04
Product Code: 74370
MSDS: 006694

This information presented below only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations.

If the material as supplied becomes a waste, follow all applicable regional, national and local laws and regulations.

### 14. TRANSPORT INFORMATION:

**U.S. DEPARTMENT OF TRANSPORTATION (DOT) INFORMATION:**

For all package sizes and modes of transportation:
This material is not regulated for transport.

### 15. REGULATORY INFORMATION:

**NOTICE:** The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state or provincial, and local laws. The following specific information is made for the purpose of complying with numerous federal, state or provincial, and local laws and regulations.

**U.S. REGULATIONS**

**SARA 313 INFORMATION**: To the best of our knowledge, this product contains no chemical subject to SARA Title III Section 313 supplier notification requirements.

**SARA HAZARD CATEGORY:** This product has been reviewed according to the EPA "Hazard Categories" promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

Not to have met any hazard category

**TOXIC SUBSTANCES CONTROL ACT (TSCA):** All ingredients are on the TSCA inventory or are not required to be listed on the TSCA inventory.

**STATE RIGHT-TO-KNOW:** This product is not known to contain any substances subject to the disclosure requirements of

New Jersey
Pennsylvania

**OSHA HAZARD COMMUNICATION STANDARD:** This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

**COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILITY ACT (CERCLA, or SUPERFUND):** To the best of our knowledge, this product contains no chemical subject to reporting under CERCLA.

**NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) RATINGS**:

| CATEGORY | RATING |
|---|---|
| Health | 1 |
| Flammability | 1 |
| Reactivity | 0 |

### 16. OTHER INFORMATION:

**MSDS STATUS**: Revised Sections: 3,4,11,12,13,14 & 15
Reference: DR-0361-8028
Replaces MSDS Dated: 1/12/00
Document Code: D03-077-003
Replaces Document Code: D03-077-002

The Information Herein Is Given In Good Faith, But No Warranty, Express Or Implied, Is Made. Consult Dow AgroSciences For Further Information.


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# Specimen Label

Dow AgroSciences™

Glypro* Plus

**Herbicide**

*Trademark of Dow AgroSciences LLC

**For control of annual and perennial weeds and woody plants in noncrop areas and industrial sites, forests, habitat management areas, railroads, roadsides and other similar sites.**

**Avoid contact of herbicide with foliage, green stems, exposed non-woody roots or fruit of crops, desirable plants and trees, because severe injury or destruction may result.**

| | |
|---|---|
| Active Ingredient(s): | |
| glyphosate †: N-(phosphonomethyl)glycine, isopropylamine salt | 41.0% |
| Inert Ingredients | 59.0% |
| Total Ingredients | 100.0% |

† Contains 4 pounds per gallon glyphosate, isopropylamine salt (3 pounds per gallon glyphosate acid).

EPA Reg. No. 62719-322

**Keep Out of Reach of Children**

## CAUTION PRECAUCION

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

### Precautionary Statements

### Hazards to Humans and Domestic Animals

**Causes Eye Irritation**

**Avoid contact with eyes or clothing.**

### Personal Protective Equipment (PPE)

**Applicators and other handlers must wear:**

- Long-sleeved shirt and long pants
- Shoes plus socks.

Follow manufacturer's instructions for cleaning/maintaining PPE (Personal Protective Equipment). If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

### Engineering Controls

When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240 (d) (4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

### User Safety Recommendations

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.

### First Aid

**If in eyes:** Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing. Call a poison control center or doctor for treatment advice.

Have the product container or label with you when calling a poison control center or doctor or going for treatment.

**Domestic Animals:** This product is considered to be relatively nontoxic to dogs and other domestic animals; however, ingestion of this product or large amounts of freshly sprayed vegetation may result in temporary gastrointestinal irritation (vomiting, diarrhea, colic, etc.). If such symptoms are observed, provide the animal with plenty of fluids to prevent dehydration. Call a veterinarian if symptoms persist for more than 24 hours.

### Environmental Hazards

Do not apply directly to water, to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment washwaters.

### Physical or Chemical Hazards

Spray solutions of this product should be mixed, stored and applied using only stainless steel, aluminum, fiberglass, plastic or plastic-lined steel containers.

**Do not mix, store or apply this product or spray solutions of this product in galvanized steel or unlined steel (except stainless steel) containers or spray tanks.** This product, or spray solutions of this product react with such containers and tanks to produce hydrogen gas that may form a highly combustible gas mixture. This gas mixture could flash or explode, causing serious personal injury, if ignited by open flame, spark, welder's torch, lighted cigarette or other ignition source.

**Notice:** Read the entire label. Use only according to label directions. **Before using this product, read "Warranty Disclaimer," Inherent Risks of Use," and "Limitation of Remedies" at end of label booklet. If terms are unacceptable, return at once unopened.**

In case of emergency endangering health or the environment involving this product, call 1-800-992-5994. If you wish to obtain additional product information, visit our web site at www.dowagro.com.

Agricultural Chemical: Do not ship or store with food, feeds, drugs or clothing.

## Directions for Use

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.
Read all Directions for Use carefully before applying.

**This is an end-use product. Dow AgroSciences does not intend and has not registered it for reformulation.**

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your state or tribe, consult the agency responsible for pesticide regulation.

## Agricultural Use Requirements

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE), and restricted entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 4 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

- Coveralls
- Chemical resistant gloves, such as butyl rubber ≥ 14 mils, or natural rubber ≥ 14 mils, or neoprene rubber ≥ 14 mils, or nitrile rubber ≥ 14 mils
- Shoes plus socks

## Non-Agricultural Use Requirements

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard for agricultural pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries or greenhouses.

Keep people and pets off treated areas until spray solution has dried to prevent transfer of this product onto desirable vegetation.

## Storage and Disposal

Do not contaminate water, food, feed or seed by storage or disposal.
**Pesticide Disposal:** Wastes of this pesticide may cause eye and skin irritation and may be dangerous. Improper disposal of excess pesticide, spray mixtures, or rinsate is a violation of Federal law. If these wastes cannot be disposed of according to label use instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.
**Container Disposal:** Emptied container retains vapor and product residue. Observe all labeled safeguards until container is cleaned, reconditioned or destroyed. Do not reuse this container. Triple rinse (or equivalent). Then puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

## General Information
**(How this product works)**

Glypro* Plus herbicide is a postemergence, systemic herbicide with no soil residual activity and is intended for control of annual and perennial weeds and woody plants in noncrop and forest areas. Glypro Plus is generally non-selective and gives broad-spectrum control of many annual weeds, perennial weeds, woody brush and trees. It is formulated as a water-soluble liquid. No additional surfactants, additives containing surfactant, buffering agents or pH adjusting agents are needed or recommended. It may be applied through most standard industrial or field-type sprayers after dilution and thorough mixing with water or other carriers according to label instructions.

Do not add surfactants, additives containing surfactants, buffering agents or pH adjusting agents to the spray solution when Glypro Plus is the only pesticide used. Ammonium sulfate may be used. See the “Mixing” section of this label for instructions.

**Time to Symptoms:** The active ingredient in Glypro Plus moves through the plant from the point of foliage contact to and into the root system. Visible effects on most annual weeds occur within 2 to 4 days, but on most perennial weeds may not occur for 7 days or more. Extremely cool or cloudy weather following treatment may slow activity of Glypro Plus and delay development of visual symptoms. Visible effects are a gradual wilting and yellowing of the plant that advances to complete browning of above ground growth and deterioration of underground plant parts.

**Stage of Weeds:** Annual weeds are easiest to control when they are small. Best control of most perennial weeds is obtained when treatment is made at late growth stages approaching maturity. Refer to the annual, perennial, woody brush and trees rate tables for recommendations for specific weeds.

Always use the higher rate of Glypro Plus per acre within the recommended range when weed growth is heavy or dense or weeds are growing in an undisturbed (noncultivated) area.

Do not treat weeds under poor growing conditions such as drought stress, disease or insect damage, as reduced weed control may result. Reduced herbicidal activity may also occur when treating weeds heavily covered with dust.

**Cultural Considerations:** Reduced control may result when applications are made to annual or perennial weeds that have been mowed, grazed, or cut, and have not been allowed to regrow to the recommended stage for treatment.

**Rainfastness:** Heavy rainfall soon after application may wash Glypro Plus off of the foliage and a repeat application may be required for adequate control.

**Spray Coverage:** For best results, spray coverage should be uniform and complete. Do not spray weed foliage to the point of runoff.

**Mode of Action:** The active ingredient in Glypro Plus inhibits an enzyme found only in plants that is essential to formation of specific amino acids.

**No Soil Activity:** Weeds must be emerged at the time of application to be controlled by Glypro Plus. Weeds germinating from seed after application will not be controlled. Unemerged plants arising from unattached underground rhizomes or rootstocks of perennials will not be affected by the herbicide and will continue to grow.

When Glypro Plus comes in contact with soil, it is bound to soil particles. Under recommended use situations, once Glypro Plus is bound to soil particles, it is not available for plant uptake and will not harm off-site vegetation where roots grow into the treated area or if the soil is transported off-site. The strong affinity of Glypro Plus to soil particles prevents Glypro Plus from leaching out of the soil profile and entering ground water

**Biological Degradation:** Degradation of Glypro Plus is primarily a biological process carried out by soil microbes.

**Volatility:** Glypro Plus is non-volatile. Therefore, it cannot move as a vapor after application to affect nearby vegetation.

**Toxicology Testing:** Exposure to workers and other applicators generally is expected to pose minimal risks based on results of short-term toxicity studies. Glyphosate has been thoroughly tested and determined not to cause cancer or other adverse long-term health effects.

**Tank Mixing:** Glypro Plus does not provide residual weed control. For subsequent residual weed control, follow a label-approved herbicide program. Read and carefully observe the cautionary statements and all other information appearing on the labels of all herbicides used. Use according to the most restrictive label directions for each product in the mixture.

Buyer and all users are responsible for all loss or damage in connection with the use or handling of mixtures of Glypro Plus with herbicides or other materials that are not expressly recommended in this labeling. Mixing Glypro Plus with herbicides or other materials not recommended on this label may result in reduced performance.

**Annual Maximum Use Rate:** For noncrop uses, the combined total of all treatments must not exceed 10.6 quarts of Glypro Plus per acre per year. The maximum use rates stated throughout this product's labeling apply to this product combined with the use of all other herbicides containing glyphosate or sulfosate as the active ingredient, whether applied as mixtures or separately. Calculate the application rates and ensure that the total use of this and other glyphosate or sulfosate containing products does not exceed stated use rate.

## Attention

**Avoid contact of herbicide with foliage, green stems, exposed non-woody roots or fruit of crops, desirable plants and trees, because severe injury or destruction may result.**

**AVOID DRIFT. Extreme care must be used when applying Glypro Plus to prevent injury to desirable plants and crops.**

Do not allow the herbicide solution to mist, drip, drift or splash onto desirable vegetation since minute quantities of Glypro Plus can cause severe damage or destruction to the crop, plants or other areas on which treatment was not intended. The likelihood of injury occurring from the use of Glypro Plus increases when winds are gusty, as wind velocity increases, when wind direction is constantly changing or when there are other meteorological conditions that favor spray drift. When spraying, avoid combinations of pressure and nozzle type that will result in splatter or fine particles (mist) which are likely to drift. **Avoid applying at excessive speed or pressure.**

**NOTE:** Use of Glypro Plus in any manner not consistent with this label may result in injury to persons, animals or crops, or other unintended consequences. Keep container closed to prevent spills and contamination.

## Spray Drift Management

Avoiding spray drift at the application site is the responsibility of the applicator. The interaction of many equipment-and-weather-related factors determine the potential for spray drift. The applicator and the grower are responsible for considering all these factors when making decisions. The following drift management requirements must be followed to avoid off-target drift movement from aerial applications to agricultural field crops. These requirements do not apply to forestry applications, public health uses or to applications using dry formulations.

1. The distance of the outer most nozzles on the boom must not exceed 3/4 the length of the wingspan or rotor.
2. Nozzles must always point backward parallel with the air stream and never be pointed downwards more than 45 degrees. Where states have more stringent regulations, they should be observed.

The applicator should be familiar with and take into account the information covered in the following **Aerial Drift Reduction Advisory Information**:

**Importance of Droplet Size:** The most effective way to reduce drift potential is to apply large droplets. The best drift management strategy is to apply the largest droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential, but will not prevent drift if applications are made improperly, or under unfavorable environmental conditions (see Wind, Temperature and Humidity, and Temperature Inversion section of this label).

**Controlling Droplet Size:**
**Volume-**Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated flows product larger droplets.

**Pressure-**Use the lower spray pressures recommended for the nozzle. Higher pressure reduces droplet size and does not improve canopy penetration. When higher flow rates are needed, use higher flow rate nozzles instead of increasing pressure.

**Number of nozzles-**Use the minimum number of nozzles that provide uniform coverage.

**Nozzle Orientation**-Orienting nozzles so that the spray is released backwards, parallel to the airstream will produce larger droplets than other orientations. Significant deflection from the horizontal will reduce droplet size and increase drift potential.

**Nozzle Type-**Use a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles. Solid stream nozzles oriented straight back produce larger droplets than other nozzle types.

**Boom Length-**For some use patterns, reducing the effective boom length to less than 3/4 of the wingspan or rotor length may further reduce drift without reducing swath width.

**Application-**Applications should not be made at a height greater than 10 feet above the top of the largest plants unless a greater height is required for aircraft safety. Making applications at the lowest height that is safe reduces exposure of droplets to evaporation and wind.

**Swath Adjustment:** When applications are made with a crosswind, the swath will be displaced downwind. Therefore, on the up and downwind edges of the field, the applicator must compensate for this displacement by adjusting the path of the aircraft upwind. Swath adjustment distance should increase, with increasing drift potential (higher wind, smaller drops, etc.).

**Wind:** Drift potential is lowest between wind speeds of 2-10 mph. However, many factors, including droplet size and equipment type determine drift potential at any given speed. Application should be avoided below 2 mph due to variable wind direction and high inversion potential. Note: Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect drift.

**Temperature and Humidity:** When making applications in low relative humidity, set up equipment to produce larger droplets to compensate for evaporation. Droplet evaporation is most severe when conditions are both hot and dry.

**Temperature Inversions:** Applications should not occur during a temperature inversion, because drift potential is high. Temperature inversions restrict vertical air mixing, which causes small suspended droplets to remain in a concentrated cloud. This cloud can move in unpredictable directions due to the light variable winds common during inversions. Temperature inversions are characterized by increasing temperatures with altitude and are common on nights with limited cloud cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of smoke from a ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a connected cloud (under low wind conditions) indicates an inversion, while smoke that moves upwards and rapidly dissipates indicates good vertical air mixing.

**Sensitive Areas:** The pesticide should only be applied when the potential for drift to adjacent sensitive areas (e.g., residential areas, bodies of water, known habitat for threatened or endangered species, non-target crops) is minimal (e.g., when wind is blowing away from the sensitive areas).

## Mixing

Clean sprayer parts immediately after using Glypro Plus by thoroughly flushing with water.

**NOTE: reduced results may occur if water containing soil is used, such as visibly muddy water or water from ponds and ditches that is not clear.**

### Mixing with Water

Glypro Plus mixes readily with water. Mix spray solutions of Glypro Plus as follows: Fill the mixing or spray tank with the required amount of water. Add the recommended amount of Glypro Plus near the end of the filling process and mix well. Use caution to avoid siphoning back into the carrier source. Use approved anti-back-siphoning devices where required by state or local regulations. During mixing and application, foaming of the spray solution may occur. To prevent or minimize foam, avoid the use of mechanical agitators, terminate by-pass and return lines at the bottom of the tank and, if needed, use an approved anti-foam or defoaming agent.

### Tank Mixing Procedure

Mix labeled tank mixtures of Glypro Plus with water as follows:

1. Place a 20 to 35 mesh screen or wetting basket over filling port.
2. Through the screen, fill the spray tank one-half full with water and start agitation.
3. If a wettable powder is used, make a slurry with the water carrier, and add it **slowly** through the screen into the tank. Continue agitation.
4. If a flowable formulation is used, premix one part flowable with one part water. Add diluted mixture **slowly** through the screen into the tank. Continue agitation.
5. If an emulsifiable concentrate formulation is used, premix one part emulsifiable concentrate with two parts water. Add diluted mixture slowly through the screen into the tank. Continue agitation.
6. Continue filling the spray tank with water and add the required amount of Glypro Plus near the end of the filling process.
7. Add individual formulations to the spray tank as follows: wettable powder, flowable, emulsifiable concentrate, drift control additive and water-soluble liquid.

Maintain good agitation at all times until the contents of the tank are sprayed. If the spray mixture is allowed to settle, thorough agitation is required to resuspend the mixture before spraying is resumed.

Keep by-pass line on or near the bottom of the tank to minimize foaming. Screen size in nozzle or line strainers should be no finer than 50 mesh.

Always predetermine the compatibility of labeled tank mixtures of Glypro Plus with water carrier by mixing small proportional quantities in advance.

Refer to the “Tank Mixing” section under “General Information” for additional precautions.

## Mixing for Hand-held Sprayers

Prepare the desired volume of spray solution by mixing the amount of Glypro Plus in water as shown in the following table:

**Spray Solution**

| Spray Concentration (percent) | Amount of Glypro Plus for Desired Volume: | | |
|---|---|---|---|
| | 1 gal | 25 gal | 100 gal |
| **1/2%** | 2/3 fl oz | 1 pt | 2 qt |
| **1%** | 1 1/3 fl oz | 1 qt | 1 gal |
| **1 1/2%** | 2 fl oz | 1 1/2 qt | 1 1/2 gal |
| **2%** | 2 2/3 fl oz | 2 qt | 2 gal |
| **5%** | 6 1/2 fl oz | 5 qt | 5 gal |
| **10%** | 13 fl oz | 10 qt | 10 gal |

2 tablespoons = 1 fluid ounce

For use in knapsack sprayers, it is suggested that the recommended amount of Glypro Plus be mixed with water in a larger container. Fill sprayer with the mixed solution.

## Ammonium Sulfate

The addition of 1 to 2 percent dry ammonium sulfate by weight or 8.5 to 17 pounds per 100 gallons of water may increase the performance of Glypro Plus, particularly when tank mixed with certain residual herbicides on annual and perennial weeds. The equivalent rate of ammonium sulfate in a liquid formulation may also be used. Ensure that ammonium sulfate is completely dissolved in the spray tank before adding herbicides. Thoroughly rinse the spray system with clean water after use to reduce corrosion.

**Note:** When using ammonium sulfate, apply Glypro Plus at rates recommended in this label. Lower rates will result in reduced performance.

## Colorants or Dyes

Agriculturally-approved colorants or marking dyes may be added to Glypro Plus. Colorants or dyes used in spray solutions of Glypro Plus may reduce performance, especially at lower rates or dilutions. Use colorants or dyes according to the manufacturer's recommendations.

## Drift Control Additives

Drift control additives may be used with all equipment types, except wiper applicators, sponge bars and CDA equipment. When a drift control additive is used, read and carefully observe the cautionary statements and all other information appearing on the additive label.

# Application Equipment and Techniques

Do not apply Glypro Plus through any type of irrigation system.

Glypro Plus may be applied with the following application equipment:

**Aerial:** Fixed Wing and Helicopter

**Ground Broadcast Spray:** Boom or boomless systems, pull-type sprayer, floaters, pick-up sprayers, spray coupes and other ground broadcast equipment.

**Hand-Held and High-Volume Spray Equipment:** Knapsack and backpack sprayers, pump-up pressure sprayers, handguns, hand wands, mistblowers[1], lances and other hand-held and motorized spray equipment used to direct the spray onto weed foliage.

[1] Glypro Plus is not registered in California or Arizona for use in mistblowers.

**Selective Equipment:** Recirculating sprayers, shielded and hooded sprayers, wiper applicators and sponge bars.

**Injection Systems:** Aerial or ground injection sprayers.

**Controlled Droplet Applicator (CDA):** Hand-held or boom-mounted applicators, which produce a spray, consisting of a narrow range of droplet sizes.

**Apply these spray solutions in properly maintained and calibrated equipment capable of delivering desired volumes.**

**Injection and Frill Application (Woody Brush and Trees)**: Use suitable equipment that will deliver Glypro Plus into the living tissue of trees and brush.

**Cut Stump Application:** Apply using suitable equipment to ensure coverage of the entire cambium of cut stems.

## Aerial Equipment

**Do not apply Glypro Plus using aerial spray equipment except under conditions as specified within this label.**

Use the recommended rates of this herbicide in 3 to 15 gallons of water per acre unless otherwise specified on this label. Unless otherwise specified, do not exceed 1 quart per acre. Refer to the individual use area sections of this label for recommended volumes and application rates.

**For aerial application in California, refer to the federal supplemental label for aerial applications in that state for specific instructions, restrictions and requirements.** Tank mixtures of Glypro Plus plus Oust, Banvel (dicamba) or 2,4-D herbicide may not be applied by air in California.

Avoid direct application to any body of water.

**AVOID DRIFT: do not apply during low-level inversion conditions, when winds are gusty or under any other condition which favors drift. Drift may cause damage to any vegetation contacted to which treatment is not intended. To prevent injury to adjacent desirable vegetation, appropriate buffer zones must be maintained.**

Coarse sprays are less likely to drift; therefore, do not use nozzles or nozzle configurations that dispense spray as fine spray droplets. Do not angle nozzles forward into the airstream and do not increase spray volume by increasing nozzle pressure.

**Ensure uniform application:** To avoid streaked, uneven or overlapped application, use appropriate marking devices.

Thoroughly wash aircraft, especially landing gear, after each day of spraying to remove residues of Glypro Plus accumulated during spraying or from spills. **Prolonged exposure of Glypro Plus to uncoated steel surfaces may result in corrosion and possible failure of the part. Landing gear are most susceptible.** The maintenance of an organic coating (paint), which meets aerospace specification MIL-C-38413, may prevent corrosion.

## Ground Broadcast Equipment

Use the recommended rates of Glypro Plus in 3 to 40 gallons of water per acre as a broadcast spray unless otherwise specified. As density of weeds increases, spray volume should be increased within the recommended range to ensure complete coverage. Carefully select proper nozzles to avoid spraying a fine mist. For best results with ground application equipment, use flat fan nozzles. Check for even distribution of spray droplets.

## Hand-Held and High-Volume Equipment

Apply to foliage of vegetation to be controlled. For applications made on a spray-to-wet basis, spray coverage should be uniform and complete. Do not spray to the point of runoff. Use coarse sprays only.

For control of weeds listed in the annual weeds rate tables, apply a 0.5 percent solution of Glypro Plus to weeds less than 6 inches in height or runner length. Apply prior to seedhead formation in grass or bud formation in broadleaf weeds. For annual weeds over 6 inches tall, or unless otherwise specified, use a 1 percent solution.

For best results, use a 2 percent solution on harder-to-control perennials, such as bermudagrass, dock, field bindweed, hemp dogbane, milkweed and Canada thistle.

For low volume directed spray applications, use a 5 to 10 percent solution of this product for control or partial control of annual weeds, perennial weeds, or woody brush and trees. Spray coverage should be uniform with at least 50% of the foliage contacted. Coverage of the top one-half of the plant is important for best results. To ensure adequate spray coverage, spray both sides of large or tall woody brush and trees, when foliage is thick and dense, or where there are multiple sprouts.

## Selective Equipment

Glypro Plus may be applied through recirculating spray systems, shielded applicators, hooded sprayers, wiper applicators or sponge bars after dilution and thorough mixing with water to listed weeds growing in any noncrop site specified on this label and only when specifically recommended in cropping systems.

A recirculating spray system directs the spray solution onto weeds growing above desirable vegetation, while spray solution not intercepted by weeds is collected and returned to the spray tank for reuse.

A shielded or hooded applicator directs the herbicide solution onto weeds, while shielding desirable vegetation from the herbicide.

A wiper or sponge applicator applies the herbicide solution onto weeds by rubbing the weed with an absorbent material containing the herbicide solution.

**Avoid contact of herbicide with desirable vegetation.**

Contact of the herbicide solution with desirable vegetation may result in damage or destruction. Applicators used above desirable vegetation should be adjusted so that the lowest spray stream or wiper contact point is at least 2 inches above the desirable vegetation. Droplets, mist, foam or splatter of the herbicide solution settling on desirable vegetation may result in discoloration, stunting or destruction.

Applications made above the crops should be made when the weeds are a minimum of 6 inches above the desirable vegetation. Better results may be obtained when more of the weed is exposed to the herbicide solution. Weeds not contacted by the herbicide solution will not be affected. This may occur in dense clumps, severe infestations or when the height of the weeds varies so that not all weeds are contacted. In these instances, repeat treatment may be necessary.

**Shielded and hooded applicators**

Use nozzles that provide uniform coverage within the treated area. Keep shields on these sprayers adjusted to protect desirable vegetation. **Extreme care must be exercised to avoid contact of herbicide with desirable vegetation.**

**Wiper applicators and sponge bars**

Wiper applicators are devices that physically wipe appropriate amounts of Glypro Plus directly onto the weed.

Equipment must be designed, maintained and operated to prevent the herbicide solution from contacting desirable vegetation. Operate this equipment at ground speeds no greater than 5 mph. Performance may be improved by reducing speed in areas of heavy weed infestations to ensure adequate wiper saturation. Better results may be obtained if 2 applications are made in opposite directions.

Avoid leakage or dripping onto desirable vegetation. Adjust height of applicator to ensure adequate contact with weeds. Keep wiping surfaces clean. Be aware that, on sloping ground, the herbicide solution may migrate, causing dripping on the lower end and drying of the wicks on the upper end of a wiper applicator.

Do not use wiper equipment when weeds are wet.

Mix only the amount of solution to be used during a 1-day period, as reduced activity may result from use of leftover solutions. Clean wiper parts immediately after using Glypro Plus by thoroughly flushing with water.

Do not add surfactant to the herbicide solution.

**For Rope or Sponge Wick Applicators:** Mix 1 gallon of Glypro Plus in 2 gallons of water to prepare a 33 percent solution. Apply this solution to weeds listed in this section.

**For Porous-Plastic Applicators:** Solutions ranging from 33 to 100 percent of Glypro Plus in water may be used in porous-plastic wiper applicators.

When applied as recommended, Glypro Plus **controls** the following weeds:

corn, volunteer
panicum, Texas
rye, common
shattercane
sicklepod
spanishneedles
starbur, bristly

When applied as recommended, Glypro Plus **suppresses** the following weeds:

beggarweed, Florida
bermudagrass
dogbane, hemp
dogfennel
guineagrass
johnsongrass
milkweed
nightshade, silverleaf
pigweed, redroot
ragweed, common
ragweed, giant
smutgrass
sunflower
thistle, Canada
thistle, musk
vaseygrass
velvetleaf

## Injection Systems

Glypro Plus may be used in aerial or ground injection spray systems. It may be used as a liquid concentrate or diluted prior to injecting into the spray stream. Do not mix Glypro Plus with the concentrate of other products when using injection systems.

## CDA Equipment

The rate of Glypro Plus applied per acre by vehicle-mounted controlled droplet application (CDA) equipment must not be less than the amount recommended in this label when applied by conventional broadcast equipment. For vehicle-mounted CDA equipment, apply 3 to 15 gallons of water per acre.

For the control of annual weeds with hand-held CDA units, apply a 20 percent solution of Glypro Plus at a flow rate of 2 fluid ounces per minute and a walking speed of 1.5 mph (1 quart per acre). For the control of perennial weeds, apply a 20 to 40 percent solution of Glypro Plus at a flow rate of 2 fluid ounces per minute and a walking speed of 0.75 mph (2 to 4 quarts per acre).

Controlled droplet application equipment produces a spray pattern that is not easily visible. Extreme care must be exercised to avoid spray or drift contacting the foliage or any other green tissue of desirable vegetation, as damage or destruction may result.

## Injection and Frill Application
**(Woody Brush and Trees)**

**Types of Application:** Injection and frill application may be used in any noncrop site listed on this label

Glypro Plus may be used to control woody brush and trees by injection or frill applications. Apply Glypro Plus using suitable equipment that must penetrate into the living tissue. Apply the equivalent of 1 ml of Glypro Plus per each 2 to 3 inches of trunk diameter at breast height (DBH). This is best achieved by applying a 50 to 100 percent concentration of Glypro Plus either to a continuous frill around the tree or as cuts evenly spaced around the tree below all branches. As tree diameter increases in size, better results are achieved by applying diluted material to a continuous frill or more closely spaced cuttings. Avoid application techniques that allow runoff to occur from frilled or cut areas in species that exude sap freely. In species such as this, make the frill or cuts at an oblique angle to produce a cupping effect and use a 100 percent concentration of Glypro Plus. For best results, applications should be made during periods of active growth and after full leaf expansion. Glypro Plus will control many species, some of which are listed below:

| **Control** | **Partial Control** |
|---|---|
| Oak | Black gum |
| Poplar | Dogwood |
| Sweetgum | Hickory |
| Sycamore | Maple, red |

## Cut Stump Application

**Types of Application:** Treating cut stumps in any noncrop site listed on this label

**Specific Use Recommendations:** Glypro Plus will control regrowth of cut stumps and resprouts of many types of woody brush and tree species, some of which are listed below. Apply Glypro Plus using suitable equipment to ensure coverage of the entire cambium. Cut trees or resprouts close to the soil surface. Apply a 50 to 100 percent solution of Glypro Plus to the freshly cut surface immediately after cutting. Delays in application may result in reduced performance. For best results, applications should be made during periods of active growth and full leaf expansion.

alder
coyote brush†
dogwood†
eucalyptus
Hickory†
madrone
maple†
oak
poplar†
reed, giant
saltcedar
sweetgum
sycamore†
tan oak
willow

† Glypro Plus is not approved for this use on these species in the state of California.

**Precautions and Restrictions: Do not make cut stump applications when the roots of desirable woody brush or trees may be grafted to the roots of the cut stump. Injury resulting from root grafting may occur in adjacent woody brush or trees.**

## General Noncrop Areas and Industrial Sites

**Labeled Use Sites:** Glypro Plus may be used in areas such as airports, apartment complexes, Christmas tree farms, ditch banks, dry ditches, dry canals, fencerows, golf courses, industrial sites, lumberyards, manufacturing sites, office complexes, ornamental nurseries, parks, parking areas, petroleum tank farms and pumping installations, railroads, recreational areas, residential areas, roadsides, sod or turf seed farms, schools, storage areas, utility substations, warehouse areas, other public areas, and similar industrial and noncrop sites and wildlife habitat management areas.

**Types of Applications:** General nonselective weed control, trim-and-edge, chemical mowing, cut stumps, injection and frill, habitat management.

Glypro Plus may be used in general noncrop areas. It may be applied with any application equipment described in this label. Glypro Plus may be used to trim-and-edge around objects in noncrop sites, for spot treatment of unwanted vegetation and to eliminate unwanted weeds growing in established shrub beds or ornamental plantings. Glypro Plus may be used prior to planting an area to ornamentals, flowers, turfgrass (sod or seed), or prior to laying asphalt or beginning construction projects.

## General nonselective weed control, Trim-and-edge and Bare Ground

Glypro Plus may be tank mixed with the following herbicide products. Refer to these product labels for labeled application sites and application rates. For annual weeds, use 1 quart per acre of Glypro Plus when weeds are less than 6 inches tall and 1.5 quarts per acre when weeds are greater than 6 inches tall. If weed growth is heavy or dense and/or growing in an undisturbed (non-cultivated) area and/or growing under stress, up to 4 quarts per acre may be applied. For perennial weeds, apply 2 to 5 quarts per acre in these tank mixes. For tank mixtures of Glypro Plus with these products through backpack sprayers, handguns or other high-volume spray-to-wet applications, see the "Hand-Held and High Volume Equipment" section of this label for recommended rates.

| | |
|---|---|
| Arsenal | Plateau |
| Banvel (dicamba) | Princep DF |
| Barricade 65WG | Princep Liquid |
| diuron | Ronstar 50WP |
| Endurance | Sahara |
| Escort | simazine |
| Karmex DF | Surflan* |
| Krovar I DF | Telar |
| Oust | Vanquish |
| Pendulum 3.3 EC | 2,4-D |
| Pendulum WDG | |

Tank mixtures of Glypro Plus with Oust, Banvel and 2,4-D may not be applied by air in California.

When applied as a tank mixture for bare ground, Glypro Plus provides control of the emerged annual weeds and control or partial control of emerged perennial weeds, woody brush and trees.

For control or partial control of the following perennial weeds, apply 1 to 2 quarts of Glypro Plus plus 2 to 4 ounces of Oust per acre.

| | |
|---|---|
| Bahiagrass | Fescue, tall |
| Bermudagrass | Johnsongrass |
| Broomsedge | Poorjoe |
| Dallisgrass | Quackgrass |
| Dock, curly | Vaseygrass |
| Dogfennel | Vervain, blue |

## Chemical mowing

**Perennials:** Glypro Plus will suppress perennial grasses listed in this section to serve as a substitute for mowing. Apply Glypro Plus at a rate of 6 to 8 fluid ounces per acre. Use 8 fluid ounces of Glypro Plus per acre when treating tall fescue, fine fescue, orchardgrass or quackgrass covers. Use 6 fluid ounces of Glypro Plus per acre when treating Kentucky bluegrass. Apply treatments in 10 to 40 gallons of spray solution per acre.

**Precautions and Restrictions:** Use only in areas where some temporary injury or discoloration of perennial grasses can be tolerated.

**Annuals:** For growth suppression of some annual grasses, such as annual ryegrass, wild barley and wild oats growing in coarse turf on roadsides or other industrial areas, apply 4 to 5 fluid ounces of Glypro Plus in 10 to 40 gallons of spray solution per acre. Applications should be made when annual grasses are actively growing and before the seedheads are in the boot stage of development. Treatments may cause injury to the desired grasses.

## Dormant turfgrass

Glypro Plus may be used to control or suppress many winter annual weeds and tall fescue for effective release of dormant bermudagrass and bahiagrass turf. Treat only when turf is dormant and prior to spring greenup.

Apply 8 to 64 fluid ounces of Glypro Plus per acre. Apply the recommended rates in 10 to 40 gallons of water per acre. Use only in areas where bermudagrass or bahiagrass are desirable ground covers and where some temporary injury or discoloration can be tolerated.

Treatments in excess of 16 fluid ounces per acre may result in injury or delayed greenup in highly maintained areas, such as golf courses and lawns. **Do not** apply tank mixtures of Glypro Plus plus Oust in highly maintained turfgrass areas. For further uses, refer to the "**Roadsides**" section of this label, which gives rates for dormant bermudagrass and bahiagrass treatments.

## Actively growing bermudagrass

Glypro Plus may be used to control or partially control many annual and perennial weeds for effective release of actively growing bermudagrass. **Do not** apply more than 16 fluid ounces of Glypro Plus per acre in highly maintained turfgrass areas. **Do not** apply tank mixtures of Glypro Plus plus Oust in highly maintained turfgrass areas. For further uses, refer to the **"Roadsides"** section of this label, which gives rates for bermudagrass treatments. Use only in areas where some temporary injury or discoloration can be tolerated.

## Turfgrass renovation, seed, or sod production

Glypro Plus controls most existing vegetation prior to renovating turfgrass areas or establishing turfgrass grown for seed or sod. For maximum control of existing vegetation, delay planting or sodding to determine if any regrowth from escaped underground plant parts occurs. When repeat treatments are necessary, sufficient regrowth must be attained prior to application. For warm-season grasses such as bermudagrass, summer or fall applications provide the best control. Where existing vegetation is growing under mowed turfgrass management, apply Glypro Plus after omitting at least one regular mowing to allow sufficient growth for good interception of the spray.

Do not disturb soil or underground plant parts before treatment. Tillage or renovation techniques such as vertical mowing, coring or slicing should be delayed for 7 days after application to allow translocation into underground plant parts.

Desirable turfgrasses may be planted following the above procedures.

Hand-held equipment may be used for spot treatment of unwanted vegetation growing in existing turfgrass. Broadcast or hand-held equipment may be used to control sod remnants or other unwanted vegetation after sod is harvested.

Do not feed or graze turfgrass grown for seed or sod production for 8 weeks following application.

## Ornamentals, Plant Nurseries and Christmas trees

**Post-direct, Trim-and-edge:** Glypro Plus may be used as a post-directed spray around established woody ornamental species such as arborvitae, azalea, boxwood, crabapple, eunoymus, fir, douglas fir, jojoba, hollies, lilac, magnolia, maple, oak, privet, pine, spruce and yew. Glypro Plus may also be used to trim and edge around trees, buildings, sidewalks and roads, potted plants and other objects in a nursery setting.

Desirable plants may be protected from the spray solution by using shields or coverings made of cardboard or other impermeable material. **This product is not recommended for use as any over-the-top broadcast spray in ornamentals and Christmas trees**. Care must be exercised to avoid contact of spray, drift or mist with foliage or green bark of established ornamental species.

**Site preparation:** Glypro Plus may be used prior to planting any ornamental, nursery or Christmas tree species.

**Greenhouse/Shadehouse:** Glypro Plus may be used to control weeds growing in and around greenhouses and shadehouses. Desirable vegetation must not be present during application and air circulation fans must be turned off.

## Forestry Site Preparation

Glypro Plus herbicide is recommended for the control or partial control of woody brush, trees and herbaceous weeds in forestry. This product is also recommended for use in preparing or establishing wildlife openings within these sites and maintaining logging roads.

In forestry sites, Glypro Plus is recommended for use in site preparation prior to planting any tree species, including Christmas trees, eucalyptus, hybrid tree cultivars and silvicultural nursery sites. Unless otherwise specified, applications of this product may be made for control or partial control of herbaceous weeds, woody brush and trees listed in the "Weeds Controlled" section of the product label for Glypro Plus.

**Application Rates:**

| Method of Application | Application Rate | Spray Volume (gal/acre) |
|---|---|---|
| **Broadcast** | | |
| Aerial | 2 to 10 qt/acre | 5 to 30 |
| Ground | 2 to 10 qt/acre | 10 to 60 |
| **Spray-to-Wet** | | |
| Handgun | 1 to 2% | spray-to-wet |
| Backpack | by volume | |
| **Low Volume Directed Spray** †† | | |
| Handgun | 5% to 10% | partial coverage |
| Backpack | by volume | |

†† For low volume directed spray applications, coverage should be uniform with at least 50 percent of the foliage contacted. For best results, coverage of the top one-half of the plant is important.

Use higher rates of Glypro Plus within the recommended rate ranges for control or partial control of woody brush, trees and hard-to-control perennial herbaceous weeds. For best results, apply to actively growing woody brush and trees after full leaf expansion and before fall color and leaf drop. Use increased rates within the recommended rate range to control of perennial herbaceous weeds from emergence up to the appearance of seedheads, flowers or berries. Use lower rates within the recommended rate range to control annual herbaceous weeds and actively growing perennial herbaceous weeds after seedheads, flowers or berries appear. Apply to foliage of actively growing annual herbaceous weeds anytime after emergence.

This product has no herbicidal or residual activity in the soil. Where repeat applications are necessary, do not exceed 10.7 quarts per acre per year.

**Tank Mixtures**

Glypro Plus may be used in tank mix combination with other herbicide products to broaden the spectrum of vegetation controlled. When tank mixing, read and observe applicable use directions, precautions and limitations on the respective product labels. Use according to the most restrictive precautionary statements for each product on the mixture. Any recommended rate of Glypro Plus may be used in a tank mix.

**Note:** For forestry site preparation, make sure the tank mix product is approved for use prior to planting the desired species. Observe planting interval restrictions.

Any recommended rate of this product may be used in a tank mix with the following products for forestry site preparation:

| Product | Method of Application and Use Rates |
|---|---|
| | **Broadcast** |
| Garlon* 3A† herbicide | 1 to 4 qt/acre |
| Garlon 4 herbicide | 1 to 4 qt/acre |
| Arsenal Applicators Concentrate | 2 to 16 fl oz/acre |
| Escort herbicide | 1/2 to 1 1/2 oz/acre |
| Chopper herbicide | 4 to 32 fl oz/acre |
| Oust herbicide | 1 to 4 oz/acre |
| | **Spray-to-Wet Rates** |
| Arsenal Applicators Concentrate | 1/32% to 1/2% by volume |
| | **Low Volume Directed Spray Rates** |
| Arsenal Applicators Concentrate | 1/8% to 1/2% by volume |

† Ensure that Garlon 3A is thoroughly mixed with water before adding Glypro Plus. Agitation is required while mixing Glypro Plus with Garlon 3A to avoid compatibility problems.

For control of herbaceous weeds, use the lower recommended tank mixture rates. For control of dense stands or difficult-to-control woody brush and trees, use the higher recommended rates.

**Aerial Equipment**

Glypro Plus is recommended for aerial application in forestry sites by helicopter only. For details on aerial application, refer to "Aerial Equipment" in the "Application Equipment and Techniques" section of this label.

**Ground Broadcast Equipment**

Glypro Plus is recommended for broadcast applications using suitable ground equipment in forestry sites. For details on ground broadcast application, refer to "Ground Broadcast Equipment" in the "Application Equipment and Techniques" section of this label. Apply the recommended rates of Glypro Plus as a broadcast spray in 10 to 60 gallons of clean water per acre. Check for even distribution throughout the spray pattern.

**Backpack and Handgun Equipment**

Glypro Plus is recommended for application through backpack and handgun equipment. For details, refer to "Hand-Held and High Volume Equipment" in the "Application Equipment and Techniques" section of this label.

For spray-to-wet applications, coverage should be uniform and complete, but not to the point of runoff.

Glypro Plus may be used for low volume directed sprays for spot treatment of trees and brush. It is most effective in areas where there is a low density of undesirable trees or brush. If a straight stream nozzle is used, start the application at the top of the targeted vegetation and spray from top to bottom in a lateral zigzag motion. For flat fan and cone nozzles, spray the foliage of the targeted vegetation. Small, open branched trees need only be treated from one side. If the foliage is thick or there are multiple root sprouts, application must be made from several sides to ensure adequate spray coverage.

**Injection and Frill Application**

Glypro Plus may be used to control woody brush and trees injection or frill applications. For details, refer to "Injection and Frill Application" in the "Application Equipment and Techniques" section of this label.

**Cut Stump Application**

Woody vegetation may be controlled by treating freshly cut stumps of trees and resprouts with this product. For details, refer to "Cut Stump Application" in the "Application Equipment and Techniques" section of this label.

**Selective Equipment**

Glypro Plus may be applied through shielded sprayers or wiper application equipment. For details, refer to "Selective Equipment" in the "Application Equipment and Techniques" section of this label.

## Wildlife Habitat Management and Restoration

**Types of Uses:** Habitat restoration and maintenance, wildlife food plots

**Habitat restoration and maintenance**

**Specific Use Recommendations:** Glypro Plus may be used to control exotic and other undesirable vegetation in habitat management and natural areas, including rangeland and wildlife refuges. Applications can be made to allow recovery of native plant species, prior to planting desirable native species, and for similar broad-spectrum vegetation control requirements. Spot treatments can be made to selectively remove unwanted plants for habitat maintenance and enhancement.

**Wildlife food plots**

**Specific Use Recommendations:** Glypro Plus may be used as a site preparation treatment to control annual and perennial weeds prior to planting wildlife food plots. Any wildlife food species may be planted after applying Glypro Plus, or native species may be allowed to repopulate the area. If tillage is needed to prepare a seedbed, wait 7 days after application before tillage.

## Parks, Recreational and Residential Areas

Glypro Plus may be used in parks, recreational and residential areas. It may be applied with any application equipment described in this label. Glypro Plus may be used to trim-and-edge around trees, fences, paths, around buildings, sidewalks, and other objects in these areas. Glypro Plus may be used for spot treatment of unwanted vegetation. Glypro Plus may be used to eliminate unwanted weeds growing in established shrub beds or ornamental plantings. Glypro Plus may be used prior to planting an area to ornamentals, flowers, turfgrass (sod or seed), or prior to laying asphalt or beginning construction projects.

All of the instructions in the "**General Noncrop Areas and Industrial Sites**" section apply to park and recreational areas.

## Railroads

All of the instructions in the "**General Noncrop Areas and Industrial Sites**" section apply to railroads.

**Bare ground, Ballast and Shoulders, Crossings, and Spot treatment**

Glypro Plus may be used to maintain bare ground on railroad ballast and shoulders. Repeat applications of Glypro Plus may be used, as weeds emerge, to maintain bare ground. Glypro Plus may be used to control tall-growing weeds to improve line-of-sight at railroad crossings and reduce the need for mowing along rights-of-way. For crossing applications, up to 80 gallons of spray solution per acre may be used. Glypro Plus may be tank mixed with the following herbicide products for ballast, shoulder, spot, bare ground and crossing treatments:

Arsenal
Banvel (dicamba)
Diuron
Escort
Garlon 3A
Garlon 4
Hyvar X
Krovar I DF
Oust
Sahara
Spike*
Telar
Vanquish
2,4-D

**Brush control**

Glypro Plus may be used to control woody brush and trees on railroad rights-of-way. Apply 4 to 10 quarts of Glypro Plus per acre as a broadcast spray, using boom-type or boomless nozzles. Up to 80 gallons of spray solution per acre may be used. Apply a 3/4 to 2 percent solution of Glypro Plus when using high-volume spray-to-wet applications. Apply a 5 to 10 percent solution of Glypro Plus when using low volume directed sprays for spot treatment. Glypro Plus may be mixed with the following herbicide products for enhanced control of woody brush and trees:

Arsenal
Escort
Garlon 3A
Garlon 4
Tordon* K

**Bermudagrass release**

Glypro Plus may be used to control or partially control many annual and perennial weeds for effective release of actively growing bermudagrass. Apply 1 to 3 pints of Glypro Plus in up to 80 gallons of spray solution per acre. Use the lower rate when treating annual weeds below 6 inches in height (or runner length). Use the higher rate as weeds increase in size or as they approach flower or seedhead formation. These rates will also provide partial control of the following perennial species:

Bahiagrass
Bluestem, silver
Fescue, tall
Johnsongrass
Trumpetcreeper
Vaseygrass

Glypro Plus may be tank-mixed with Oust. If tank-mixed, use no more than 1 to 3 pints of Glypro Plus with 1 to 2 ounces of Oust per acre. Use the lower rates of each product to control annual weeds less than 6 inches in height (or runner length) that are listed in this label and the Oust label. Use the higher rates as annual weeds increase in size and approach the flower or seedhead stages. These rates will also provide partial control of the following perennial weeds:

Bahiagrass
Blackberry
Bluestem, silver
Broomsedge
Dallisgrass
Dewberry
Dock, curly
Dogfennel
Fescue, tall
Johnsongrass
Poorjoe
Raspberry
Trumpetcreeper
Vaseygrass
Vervain, blue

Use only on well-established bermudagrass. Bermudagrass injury may result from the treatment, but regrowth will occur under moist conditions. Repeat applications in the same season are not recommended, since severe injury may occur.

## Roadsides

All of the instructions in the "**General Noncrop Areas and Industrial Sites**" section apply to roadsides.

**Shoulder treatments**

Glypro Plus may be used on road shoulders. It may be applied with boom sprayers, shielded boom sprayers, high-volume off-center nozzles, hand-held equipment, and similar equipment.

**Guardrails and other obstacles to mowing**

Glypro Plus may be used to control weeds growing under guardrails and around signposts and other objects along the roadside.

**Spot treatment**

Glypro Plus may be used as a spot treatment to control unwanted vegetation growing along roadsides.

**Tank mixtures**

Glypro Plus may be tank-mixed with the following herbicide products for shoulder, guardrail, spot and bare ground treatments:

Banvel (dicamba)
diuron
Endurance
Escort
Krovar I DF
Oust
Pendulum 3.3 EC
Pendulum WDG
Princep DF
Princep Liquid
Ronstar 50WP
Sahara
simazine
Surflan
Telar
Vanquish
2,4-D

See the "**General Noncrop Areas and Industrial Sites**" section of this label for general instructions for tank mixing.

**Release of Bermudagrass or Bahiagrass Dormant applications**

Glypro Plus may be used to partially control many winter annual weeds and tall fescue for effective release of dormant bermudagrass or bahiagrass. Treat only when turf is dormant and prior to spring greenup. Glypro Plus may also be tank-mixed with Oust for residual control. Tank mixtures of Glypro Plus with Oust may delay greenup.

For best results on winter annuals, treat when plants are in an early growth stage (below 6 inches in height) after most have germinated. For best results on tall fescue, treat when fescue is at or beyond the 4- to 6-leaf stage.

Apply 8 to 64 fluid ounces of Glypro Plus per acre alone or in a tank mixture with 1/4 to 1 ounce per acre of Oust. Apply the recommended rates in 10 to 40 gallons of water per acre. Use only in areas where bermudagrass or bahiagrass are desirable ground covers and where some temporary injury or discoloration can be tolerated. To avoid delays in greenup and minimize injury, add no more that 1 ounce of Oust per acre on bermudagrass and no more than 0.5 ounce of Oust per acre on bahiagrass and avoid treatments when these grasses are in a semi-dormant condition.

**Actively growing bermudagrass**

Glypro Plus may be used to control or partially control many annual and perennial weeds for effective release of actively growing bermudagrass. Apply 1 to 3 pints of Glypro Plus in 10 to 40 gallons of spray solution per acre. Use the lower rate when treating annual weeds below 6 inches in height (or runner length). Use the higher rate as weeds increase in size or as they approach flower or seedhead formation. These rates will also provide partial control of the following perennial species:

| | |
|---|---|
| Bahiagrass | Johnsongrass |
| Bluestem, silver | Trumpetcreeper |
| Fescue, tall | Vaseygrass |

Glypro Plus may be tank-mixed with Oust. If tank-mixed, use no more than 1 to 2 pints of Glypro Plus with 1 to 2 ounces of Oust per acre. Use the lower rates of each product to control annual weeds less than 6 inches in height (or runner length) that are listed in this label and the Oust label. Use the higher rates as annual weeds increase in size and approach the flower or seedhead stages. These rates will also provide partial control of the following perennial weeds:

| | |
|---|---|
| Bahiagrass | Fescue, tall |
| Bluestem, silver | Johnsongrass |
| Broomsedge | Poorjoe |
| Dallisgrass | Trumpetcreeper |
| Dock, curly | Vaseygrass |
| Dogfennel | Vervain, blue |

Use only on well-established bermudagrass. Bermudagrass injury may result from the treatment, but regrowth will occur under moist conditions. Repeat applications of the tank mix in the same season are not recommended, since severe injury may occur.

**Actively growing bahiagrass**

For suppression of vegetable growth and seedhead inhibition of bahiagrass for approximately 45 days, apply 6 fluid ounces of Glypro Plus in 10 to 40 gallons of water per acre. Apply 1 to 2 weeks after full greenup or after mowing to a uniform height of 3 to 4 inches. This application must be made prior to seedhead emergence.

For suppression up to 120 days, apply 4 fluid ounces of Glypro Plus per acre, followed by an application of 2 to 4 fluid ounces per acre about 45 days later. Make no more than 2 applications per year.

A tank mixture of Glypro Plus plus Oust may be used. Apply 6 fluid ounces of Glypro Plus plus 0.25 ounces of Oust per acre 1 to 2 weeks following an initial spring mowing. Make only one application per year.

## Annual Weeds Rate Tables (Alphabetically By Species)

Water carrier volumes of 3 to 10 gallons per acre for ground applications and 3 to 5 gallons per acre for aerial applications are recommended.

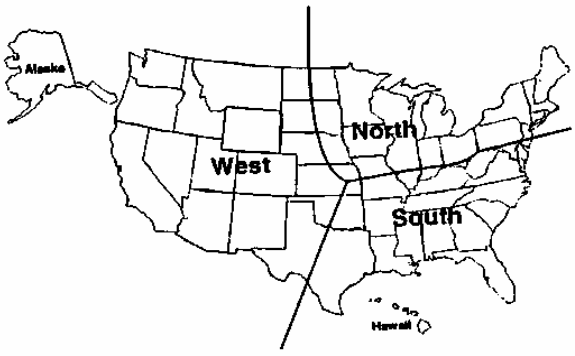
Apply to actively growing annual weeds.

Do not tank mix with soil residual herbicides when using these rates unless otherwise specified.

For weeds that have been mowed, grazed or cut, allow regrowth to occur prior to treatment.

For annual weeds, use 1 quart (32 fl oz) per acre of Glypro Plus when weeds are less than 6 inches tall and 1.5 quarts (48 fl oz) per acre when weeds are greater than 6 inches tall. If weed growth is heavy or dense and/or growing in an undisturbed (non-cultivated) area and/or growing under stress, up to 4 quarts per acre may be applied. See following table for rate information for specific weeds.

Refer to this map for location of the regions listed in the annual weed tables below.



## Annual Weeds Rate Table, North and South Regions

| Weed Species | Region | Rate of Glypro Plus † (Fluid Ounces Per Acre) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 12 | 16 | 24 | 32 | 40 | 48 |
| | | Maximum Height/Length | | | | | |
| annoda, spurred | | - | 1" | 2" | 3" | 5" | 8" |
| barley | | - | 18" | 18"+ | - | - | - |
| barnyardgrass | South | - | 3" | 5" | 7" | 9" | 12" |
| | North | - | - | 6" | 12" | - | - |
| bittercress | | - | 12" | 20" | - | - | - |
| bluegrass, annual | | - | 10" | - | - | - | - |
| bassia, fivehook | | - | - | - | 6" | - | - |
| brome, downy | | 6" | - | - | - | - | - |
| brome, Japanese | | - | 6" | - | 24" | - | - |
| browntop panicum | | - | 6" | 8" | 12" | - | 24" |
| burcucumber | | - | 6" | 12" | - | - | - |
| buttercup | | - | 12" | 20" | - | - | - |
| Carolina foxtail | | - | 20" | - | - | - | - |
| Carolina geranium | | - | - | - | 4" | - | 9" |
| carpetweed | | - | - | 6" | 12" | - | - |
| cheat | | - | 6" | 20" | - | - | - |
| chervil | | - | 20" | - | - | - | - |
| chickweed | | - | 12" | 18" | - | - | - |
| cocklebur | | - | 12" | 18" | 24" | - | - |
| copperleaf, hophornbeam | | - | 1" | 2" | 3" | 4" | 6" |
| copperleaf, Virginia | | - | 1" | 2" | 3" | 4" | 6" |
| corn | | - | 12" | 20" | - | - | - |
| corn speedwell | | - | 12" | - | - | - | - |
| crabgrass | | - | 12" | 18" | - | - | - |
| cutleaf evening primrose | | - | - | - | 3" | 3" | 6" |
| dwarfdandelion | | - | 20" | - | - | - | - |
| eastern mannagrass | | - | 8" | 12" | - | - | - |
| eclipta | | - | 4" | 8" | 12" | - | - |
| fall panicum | South | - | 4" | 6" | 8" | 12" | 24" |
| | North | - | 6" | 12" | 18" | - | - |
| falsedandelion | | - | 20" | - | - | - | - |
| falseflax, smallseed | | - | 12" | - | - | - | - |
| fiddleneck | | - | - | - | 6" | 6" | 12" |
| field pennycress | | - | 6" | 12" | - | - | - |
| filaree | | - | - | - | - | - | 12" |
| fleabane, annual | | - | 6" | 20" | - | - | - |
| fleabane, hairy (*conyza bonariensis)* | | - | 6" | - | - | - | - |
| fleabane, rough | | - | 3" | 6" | 12" | - | - |
| Florida pusley | | - | - | - | 4" | 4" | 6" |
| foxtail | South | - | 8" | 12" | 20" | - | - |
| | North | 18" | 18"+ | - | - | - | - |
| goatgrass, jointed | | - | 6" | - | - | - | - |
| goosegrass | | - | 3" | 5" | 8" | - | 18" |
| grain sorghum (milo) | | - | 6" | 12" | 20" | - | - |
| groundsel, common | | - | 6" | - | - | - | - |
| hemp sesbania | | - | - | 2" | 4" | 6" | 8" |

## Annual Weeds Rate Table, North and South Regions (Cont.)

| Weed Species | Region | Rate of Glypro Plus † (Fluid Ounces Per Acre) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 12 | 16 | 24 | 32 | 40 | 48 |
| | | Maximum Height/Length | | | | | |
| henbit | | - | - | - | 6" | - | 20" |
| horseweed/marestail | South | - | - | 12" | 30" | - | - |
| (*conyza canadensis)* | North | - | 6" | 12" | 18" | - | - |
| itchgrass | | - | 6" | 12" | 18" | - | - |
| jimsonweed | | - | - | - | 6" | 6" | 12" |
| johnsongrass (seedling) | South | | - | - | 18" | - | - |
| | North | - | 12" | 18" | - | - | - |
| junglerice | | - | 3" | 5" | 7" | 9" | 12" |
| knotweed | | - | 3" | 8" | 12" | - | 20" |
| kochia [1] | | - | 3 to 6" | 12" | - | - | - |
| lambsquarters | | - | 6" | 8" | 12" | - | 20" |
| little barley | | - | 20" | - | - | - | - |
| London rocket | | - | 6" | - | - | - | - |
| mayweed | | - | - | 2" | 6" | 12" | 18" |
| morningglory (*ipomoea spp.*) | | - | - | 2" | 4" | - | 6" |
| mustard, blue | | 6" | - | - | - | - | - |
| mustard, tansy | | 6" | 12" | 20" | - | - | - |
| mustard, tumble | | 6" | - | - | - | - | - |
| mustard, wild | | 6" | 12" | 18" | - | - | - |
| nightshade, black | | 6" | 12" | - | - | - | |
| nightshade, hairy | | - | 6" | 12" | - | - | - |
| oats | | - | - | 6" | 20" | - | - |
| pigweed | | - | 12" | 18" | 24" | - | - |
| prickly lettuce | | - | 6" | 12" | 20" | - | - |
| purslane | | - | - | - | 6" | 6" | 12" |
| ragweed, common | South | - | 4" | 6" | 8" | - | 11" |
| | North | - | 6" | 12" | 18" | - | - |
| ragweed, giant | | - | - | 4" | 6" | - | 11" |
| red rice | | - | - | - | 4" | - | - |
| Russian thistle | | - | 6" | - | - | | |
| rye | South | - | 6" | 20" | 60" | - | - |
| | North | - | 18" | 18"+ | - | - | - |
| ryegrass | | - | - | - | 6" | - | 7+" |
| sandbur, field | | 12" | - | - | - | - | - |
| shattercane | | - | 12" | 18" | - | - | - |
| shepherd's-purse | | - | 6" | 12" | - | - | - |
| sicklepod | | - | - | 2" | 4" | - | 8" |
| signalgrass, broadleaf | | - | 3" | 5" | 7" | 9" | 12" |
| smartweed, ladysthumb | | - | 4" | 6" | 8" | - | 12" |
| smartweed, pennsylvania | | - | 4" | 6" | 8" | - | 12" |
| sowthistle, annual | | - | - | - | 6" | - | 12" |
| spanishneedles | | - | - | - | 8" | - | 18" |
| speedwell, purslane | | - | 12" | - | - | - | - |
| sprangletop | | - | 6" | 12" | 20" | - | - |
| spurge, prostrate | | - | 6" | 12" | 20" | - | - |
| spurge, spotted | | - | 6" | 12" | 20" | - | - |

### Annual Weeds Rate Table, North and South Regions (Cont.)

| Weed Species | Region | Rate of Glypro Plus † (Fluid Ounces Per Acre) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 12 | 16 | 24 | 32 | 40 | 48 |
| | | Maximum Height/Length | | | | | |
| spurry, umbrella | | 6" | - | - | - | - | - |
| stinkgrass | | 12" | - | - | - | - | - |
| sunflower | | - | 12" | 18" | - | - | - |
| teaweed/ prickly sida | | 1" | 2" | 3" | 4" | 6" | |
| Texas panicum | | 6" | 8" | 12" | - | 24" | |
| velvetleaf | South | - | 2" | 3" | 4" | 5" | 8" |
| | North | - | 3" | 6" | 12" | - | - |
| Virginia pepperweed | | - | 18 | - | - | - | - |
| waterhemp | | - | - | 6" | 12" | - | - |
| wheat | South | - | 6" | 30" | - | - | - |
| | North | - | 18" | 18"+ | - | - | - |
| wheat (over-wintered) | | - | 6" | 18" | - | - | - |
| wild oats | | - | 12" | - | - | - | - |
| wild proso millet | | - | - | 6" | 12" | 12" | 18" |
| witchgrass | | - | 12" | - | - | - | - |
| woolly cupgrass | | - | 6" | 12" | - | - | - |
| yellow rocket | | - | - | 12" | 20" | - | - |

[1] Do not treat kochia in the button stage.

† If weed growth is heavy or dense and/or growing in an undisturbed (non-cultivated) area and/or growing under stress, up to 4 quarts per acre may be applied.

### Annual Weeds Rate Table, West Region

| Weed Species | Rate of Glypro Plus † (Fluid Ounces Per Acre) | | | | |
|---|---|---|---|---|---|
| | 12 | 16 | 24 | 32 | 48 |
| | Maximum Height/Length | | | | |
| barley | 12" | - | - | - | - |
| barnyardgrass | 6" | - | - | - | - |
| bluegrass, annual | 6" | - | - | - | - |
| bluegrass, bulbous | - | 6" | - | - | - |
| brome, downy [1] | 6" | - | - | - | - |
| buttercup | - | 12" | - | - | - |
| cheat | - | 6" | - | - | - |
| chickweed | - | 6" | - | - | - |
| cocklebur | - | 12" | - | - | - |
| corn | - | 6" | | - | - |
| crabgrass | - | 12" | | - | - |
| dwarfdandelion | - | 12" | | - | - |
| fall panicum | - | 12" | | - | - |
| falseflax, smallseed | - | 12" | | - | - |
| field pennycress | - | 6" | | - | - |
| filaree | - | - | | - | 12" |
| fleabane, hairy (*conyza bonariensis)* | - | 6" | | - | - |
| Florida pusley | - | - | | 12" | - |
| foxtail | (8 fl. oz. for up to 12") | | | | |

**Annual Weeds Rate Table, West Region (Cont.)**

| Weed Species | Rate of Glypro Plus † (Fluid Ounces Per Acre) | | | | |
|---|---|---|---|---|---|
| | 12 | 16 | 24 | 32 | 48 |
| | Maximum Height/Length | | | | |
| goatgrass, jointed | - | 6" | - | - | - |
| groundsel, common | - | 6" | - | - | - |
| henbit | - | 6" | - | - | - |
| horseweed/marestail | - | 6" | - | - | - |
| johnsongrass, seedling | - | 12" | - | - | - |
| lambsquarters | - | 6" | - | - | - |
| London rocket | - | 6" | - | - | - |
| morningglory (*ipomoea spp.*) | - | 2" | - | - | - |
| mustard, blue | 6" | - | - | - | - |
| mustard, tansy | 6" | - | - | - | - |
| mustard, tumble | 6" | - | - | - | - |
| mustard, wild | 6" | - | - | - | - |
| pigweed | - | 12" | - | - | - |
| rye | 12" | - | - | - | - |
| ryegrass, Italian | - | 6" | - | - | - |
| sandbur, field | 12" | - | - | - | - |
| shattercane | 12" | - | - | - | - |
| shepherd's-purse | - | 6" | - | - | - |
| sowthistle, annual | - | 6" | - | - | - |
| spurge, annual | - | 6" | - | - | - |
| stinkgrass | 12" | - | - | - | - |
| Texas panicum | - | 12" | - | - | - |
| wheat | 18" | - | - | - | - |
| wild oats | - | 12" | - | - | - |
| witchgrass | - | 12" | - | - | - |

[1] For control of downy brome in no-till systems, use 16 fluid ounces per acre.

† If weed growth is heavy or dense and/or growing in an undisturbed (non-cultivated) area and/or growing under stress, up to 4 quarts per acre may be applied.

## Perennial Weeds Rate Table (Alphabetically By Species)

Apply to actively growing perennial weeds.

**NOTE**: If weeds have been mowed or tilled, do not treat until plants have resumed active growth and have reached the recommended stages.

Repeat treatments may be necessary to control weeds regenerating from underground parts or seed. Repeat treatments must be made prior to crop emergence.

Unless otherwise stated, allow 7 or more days after application before tillage.

Best results are obtained when soil moisture is adequate for active weed growth.

For difficult to control perennial weeds and woody brush and trees, where plants are growing under stressed conditions, or where infestations are dense, Glypro Plus may be used at 5 to 10 quarts per acre for enhanced results. The annual maximum use rate for Glypro Plus is 10.6 qt per acre per year.

| Weed Species | Rate (qt/acre) | Water Volume (gpa) | Hand-Held (% Solution) |
|---|---|---|---|
| **Alfalfa** | **1 - 2** | **3 - 10** | **2%** |
| Make applications after the last hay cutting in the fall. Allow alfalfa to regrow to a height of 6 to 8 inches or more prior to treatment. Applications should be followed with deep tillage at least 7 days after treatment, but before soil freeze-up. | | | |
| **Alligatorweed** | **4** | **3 -20** | **1.5%** |
| Partial control. Apply when most of the plants are in bloom. Repeat applications will be required to maintain control. | | | |
| **Anise (fennel)** | **-** | **-** | **1 - 2%** |
| Apply as a spray-to-wet treatment. Optimum results are obtained when plants are treated at the bud to full-bloom stage of growth. | | | |
| **Bahiagrass** | **3 - 5** | **3 - 20** | **2%** |
| Apply when most plants have reached the early head stage. | | | |
| **Bentgrass** | **1.5** | **10 - 20** | **2%** |
| For suppression in grass seed production areas. For ground applications only. Ensure entire crown area has resumed growth prior to a fall application. Bentgrass should have at least 3 inches of growth. Tillage prior to treatment should be avoided. Tillage 7 to 10 days after application is recommended for best results. | | | |
| **Bermudagrass** | **3 - 5** | **3 - 20** | **2%** |
| For control, apply 5 quarts of Glypro Plus per acre. For partial control, apply 3 quarts per acre. Treat when bermudagrass is actively growing and seedheads are present. Retreatment may be necessary to maintain control. | | | |
| **Bermudagrass, water (knotgrass)** | **1 - 1.5** | **5 - 10** | **2%** |
| Apply 1.5 quarts of Glypro Plus in 5 to 10 gallons of water per acre. Apply when water bermudagrass is 12 to 18 inches in length. Allow 7 or more days before tilling, flushing or flooding the field.<br><br>**Fall applications only:** Apply 1 quart of Glypro Plus in 5 to 10 gallons of water per acre. Fallow fields should be tilled prior to application. Apply prior to frost on water bermudagrass that is 12 to 18 inches in length.<br><br>**Glypro Plus is not registered in California for use on water bermudagrass.** | | | |
| **Bindweed, field** | **0.5 - 5.0** | **3 - 20** | **2%** |
| Do not treat when weeds are under drought stress as good soil moisture is necessary for active growth.<br><br>For control, apply 4 to 5 quarts of Glypro Plus per acre west of the Mississippi River and 3 to 4 quarts east of the Mississippi River. Apply when the weeds are at or beyond full bloom. For best results, apply in late summer or fall. Fall treatments must be applied before a killing frost.<br><br>Also for control, apply 2 quarts of Glypro Plus plus 0.5 pound a.i. of dicamba in 10 to 20 gallons of water per acre. Do not apply by air.<br><br>For suppression on irrigated agricultural land, apply 1 to 2 quarts of Glypro Plus plus 1 pound a.i. of 2,4-D in 10 to 20 gallons of water per acre with ground equipment only. Applications should be made following harvest or in fall fallow ground when the bindweed is actively growing and the majority of runners are 12 inches or more in length. The use of at least one irrigation will promote active bindweed growth.<br><br>For suppression, apply 16 fluid ounces of Glypro Plus plus 0.5 pound a.i. of 2,4-D or 0.25 pound a.i. of dicamba in 3 to 10 gallons of water per acre for ground applications and 3 to 5 gallons of water per acre for aerial applications. Applications should be delayed until maximum emergence has occurred and when vines are between 6 to 18 inches in length.<br><br>**In California only**, apply 1 to 5 quarts of Glypro Plus per acre. The actual rate needed for suppression or control will vary within this range depending on local conditions. For suppression on irrigated land where annual tillage is performed, apply 1 quart of Glypro Plus in 3 to 10 gallons of water per acre. Apply to bindweed that has reached a length of 12 inches or greater. Allow maximum weed emergence and runner growth. Allow 3 or more days after application before tillage. | | | |

| Weed Species | Rate (qt/acre) | Water Volume (gpa) | Hand-Held (% Solution) |
|---|---|---|---|
| **Bluegrass, Kentucky** | **1 - 2** | **3 - 40** | **2%** |
| Apply 2 quarts of Glypro Plus in 10 to 40 gallons of water per acre when most plants have reached boot-to-early seedhead stage of development. Apply to actively growing plants when most have reached 4 to 12 inches in height. | | | |
| **Blueweed, Texas** | **3 – 5** | **3 - 40** | **2%** |
| Apply 4 to 5 quarts of Glypro Plus per acre west of the Mississippi River and 3 to 4 quarts per acre east of the Mississippi River. Apply when plants are at or beyond full bloom. New leaf development indicates active growth. For best results, apply in late summer or fall. Fall treatments must be applied before a killing frost. | | | |
| **Brackenfern** | **3 - 4** | **3 - 40** | **1 - 1.5%** |
| Apply to fully expanded fronds, which are at least 18 inches long. | | | |
| **Bromegrass, smooth** | **1 - 2** | **3 - 40** | **2%** |
| Apply 2 quarts of Glypro Plus in 10 to 40 gallons of water per acre when most plants have reached boot-to-early seedhead stage of development. Apply to actively growing plants when most have reached 4 to 12 inches in height. | | | |
| **Bursage, woolly-leaf** | **-** | **3 - 20** | **2%** |
| For control, apply 2 quarts of Glypro Plus plus 0.5 lb a.i. of dicamba per acre. For partial control, apply 1 quart of Glypro Plus plus 0.5 lb a.i. of dicamba per acre. Apply when plants are producing new active growth, which has been initiated by moisture for at least 2 weeks and when plants are at or beyond flowering. | | | |
| **Canarygrass, reed** | **2 - 3** | **3 - 40** | **2%** |
| For best results, apply when most plants have reached the boot-to-head stage of growth. | | | |
| **Cattail** | **3 - 5** | **3 - 40** | **2%** |
| Apply when most plants have reached the early head stage. | | | |
| **Clover; red, white** | **3 - 5** | **3 - 20** | **2%** |
| Apply when most plants have reached the early bud stage. | | | |
| **Cogongrass** | **3 - 5** | **2 - 40** | **2%** |
| Apply when cogongrass is at least 18 inches tall in late summer or fall. Due to uneven stages of growth and the dense nature of vegetation preventing good spray coverage, repeat treatments may be necessary to maintain control. | | | |
| **Dallisgrass** | **3 - 5** | **2 - 20** | **2%** |
| Apply when most plants have reached the early head stage. | | | |
| **Dandelion** | **3 - 5** | **3 - 40** | **2%** |
| Apply when most plants have reached the early bud stage of growth.<br><br>Also for control, apply 16 fluid ounces of Glypro Plus plus 0.5 pound a.i. 2,4-D in 3 to 10 gallons of water per acre. | | | |
| **Dock, curly** | **3 - 5** | **3 - 40** | **2%** |
| Apply when most plants have reached the early bud stage of growth.<br><br>Also for control, apply 16 fluid ounces of Glypro Plus plus 0.5 pound a.i. 2,4-D in 3 to 10 gallons of water per acre. | | | |
| **Dogbane, hemp** | **4** | **3 - 40** | **2%** |
| Apply when most plants have reached the late bud to flower stage of growth. Following mowing, allow weeds to regrow to a mature stage prior to treatment. For best results, apply in late summer or fall.<br><br>For suppression, apply 16 fluid ounces of Glypro Plus plus 0.5 pound a.i. of 2,4-D in 3 to 10 gallons of water per acre for ground applications and 3 to 5 gallons of water per acre for aerial applications. Delay applications until maximum emergence of dogbane has occurred. | | | |
| **Fescue (Except tall)** | **3 - 5** | **3 - 20** | **2%** |
| Apply when most plants have reached the early head stage. | | | |
| **Fescue, tall** | **1 - 3** | **3 - 40** | **2%** |
| Apply 3 quarts of Glypro Plus per acre when most plants have reached boot-to-early seedhead stage of development.<br><br>Fall applications only: Apply 1 quart of Glypro Plus in 3 to 10 gallons of water per acre. Apply to fescue in the fall when plants have 6 to 12 inches of new growth. A sequential application of 1 pint per acre of Glypro Plus will improve long-term control and control seedlings germinating after fall treatments or the following spring. | | | |
| **Guineagrass** | **3** | **3 - 40** | **1%** |
| Apply when most plants have reached at least the 7-leaf stage of growth. Ensure thorough coverage when using hand-held equipment. | | | |
| **Horsenettle** | **3 - 5** | **3 - 20** | **2%** |
| Apply when most plants have reached the early bud stage. | | | |
| **Horseradish** | **4** | **3 - 40** | **2%** |
| Apply when most plants have reached the late bud to flower stage of growth. For best results, apply in late summer or fall. | | | |
| **Iceplant** | **-** | **-** | **1.5 - 2.0%** |
| Iceplant should be at or beyond the early bud stage of growth. Thorough coverage is necessary for best control. | | | |

| Weed Species | Rate (qt/acre) | Water Volume (gpa) | Hand-Held (% Solution) |
|---|---|---|---|
| **Jerusalem artichoke** | **3 - 5** | **3 - 20** | **2%** |
| Apply when most plants are in the early bud stage. | | | |
| **Johnsongrass** | **0.5 - 3.0** | **3 - 40** | **1%** |
| In noncrop areas, apply 2 to 3 quarts of Glypro Plus in 10 to 40 gallons of water per acre.<br><br>For best results, apply when most plants have reached the boot-to-head stage of growth or in the fall prior to frost. Allow 7 or more days after application before tillage. Do not tank mix with residual herbicides when using the 1 quart per acre rate.<br><br>For burndown of Johnsongrass, apply 1 pint of Glypro Plus in 3 to 10 gallons of water per acre before the plants reach a height of 12 inches. For this use, allow at least 3 days after treatment before tillage.<br><br>Spot treatment (partial control or suppression): Apply a 1 percent solution of Glypro Plus when Johnsongrass is 12 to 18 inches in height. Coverage should be uniform and complete. | | | |
| **Kikuyugrass** | **2 - 3** | **3-40** | **2%** |
| Spray when most kikuyugrass is at least 8 inches in height (3 or 4-leaf stage of growth). Allow 3 or more days after application before tillage. | | | |
| **Knapweed** | **4** | **3-40** | **2%** |
| Apply when most plants have reached the late bud to flower stage of growth. For best results, apply in late summer or fall. | | | |
| **Lantana** | **-** | **-** | **1 - 1.25%** |
| Apply at or beyond the bloom stage of growth. Use the higher application rate for plants that have reached the woody stage of growth. | | | |
| **Lespedeza** | **3 - 5** | **3 - 20** | **2%** |
| Apply when most plants have reached the early bud stage. | | | |
| **Milkweed, common** | **3** | **3 - 40** | **2%** |
| Apply when most plants have reached the late bud to flower stage of growth. | | | |
| **Muhly, wirestem** | **1 - 2** | **3 - 40** | **2%** |
| Use 1 quart of Glypro Plus in 3 to 10 gallons of water per acre. Use 2 quarts of Glypro Plus when applying 10 to 40 gallons of water per acre or in sod, or noncrop areas. Spray when the wirestem muhly is 8 inches or more in height. Do not till between harvest and fall applications or in the fall or spring prior to spring applications. Allow 3 or more days after application before tillage. | | | |
| **Mullein, common** | **3 - 5** | **3 - 20** | **2%** |
| Apply when most plants are in the early bud stage. | | | |
| **Napiergrass** | **3 - 5** | **3 - 20** | **2%** |
| Apply when most plants are in the early head stage. | | | |
| **Nightshade, silverleaf** | **2** | **3 - 10** | **2%** |
| Applications should be made when at least 60 percent of the plants have berries. Fall treatments must be applied before a killing frost. | | | |
| **Nutsedge; purple, yellow** | **0.5 - 3** | **3 - 40** | **1 - 2%** |
| Apply 3 quarts of Glypro Plus per acre or apply a 1 to 2 percent solution for control of nutsedge plants and immature nutlets attached to treated plants. Treat when plants are in flower or when new nutlets can be found at rhizome tips. Nutlets, which have not germinated, will not be controlled and may germinate following treatment. Repeat treatments will be required for long-term control of ungerminated tubers.<br><br>Sequential applications: 1 to 2 quarts of Glypro Plus in 3 to 10 gallons of water per acre will also provide control. Make applications when a majority of the plants are in the 3 to 5-leaf stage (less than 6 inches tall). Repeat this application, as necessary, when newly emerging plants reach the 3 to 5-leaf stage. Subsequent applications will be necessary for long-term control.<br><br>For partial control of existing plants, apply 1 pint to 2 quarts of Glypro Plus in 3 to 40 gallons of water per acre. Treat when plants have 3 to 5 leaves and most are less than 6 inches tall. Repeat treatments will be required to control subsequent emerging plants or regrowth of existing plants. | | | |
| **Orchardgrass** | **1 - 2** | **3 - 40** | **2%** |
| Apply 2 quarts of Glypro Plus in 10 to 40 gallons of water per acre when most plants have reached boot-to-early seedhead stage of development. Apply to actively growing plants when most have reached 4 to 12 inches in height.<br><br>**Orchardgrass sods going to no-till corn:** Apply 1 to 1.5 quarts of Glypro Plus in 3 to 10 gallons of water per acre. Apply to orchardgrass that is a minimum of 12 inches tall for spring applications and 6 inches tall for fall applications. Allow at least 3 days following application before planting. A sequential application of atrazine will be necessary for optimum results. | | | |
| **Pampasgrass** | **-** | **-** | **1.5 - 2%** |
| Pampasgrass should be at or beyond the boot stage of growth. Thorough coverage is necessary for best control. | | | |
| **Paragrass** | **3 - 5** | **3 - 20** | **2%** |
| Apply when most plants are in the early head stage. | | | |
| **Phragmites** | **3 - 5** | **10 - 40** | **1 - 2%** |
| For partial control. For best results, treat during late summer or fall months or when plants are actively growing and in full bloom. Treatment before or after this stage may lead to reduced control. Due to the dense nature of the vegetation, which may prevent good spray coverage or uneven stages of growth, repeat treatments may be necessary to maintain control. Visual control symptoms will be slow to develop. | | | |

| Weed Species | Rate (qt/acre) | Water Volume (gpa) | Hand-Held (% Solution) |
|---|---|---|---|
| **Poison hemlock** | **-** | **-** | **1 - 2%** |
| Apply as a spray-to-wet treatment. Optimum results are obtained when plants are treated at the bud to full-bloom stage of growth. | | | |
| **Pokeweed, common** | | **3 - 40** | **2%** |
| Apply to actively growing plants up to 24 inches tall. | | | |
| **Quackgrass** | **1 - 3** | **3 - 40** | **2%** |
| In sod or noncrop areas apply 2 to 3 quarts of Glypro Plus in 10 to 40 gallons of water per acre when the quackgrass is greater than 8 inches tall. | | | |
| **Redvine** | **0.75 - 2** | **5 - 10** | **2%** |
| For suppression, apply 24 fluid ounces of Glypro Plus per acre at each of two applications 7 to 14 days apart or a single application of 2 quarts per acre. Apply recommended rates in 5 to 10 gallons of water per acre. Apply in late September or early October to plants that are at least 18 inches tall and have been growing 45 to 60 days since the last tillage operation. Make applications at least 1 week before a killing frost. | | | |
| **Reed, giant** | **-** | **-** | **2%** |
| Best results are obtained when applications are made in late summer to fall. | | | |
| **Ryegrass, perennial** | **1 - 3** | **3 - 40** | **1%** |
| In noncrop areas, apply 2 to 3 quarts of Glypro Plus in 10 to 40 gallons of water per acre.<br><br>For best results, apply when most plants have reached the boot-to-head stage of growth or in the fall prior to frost. Do not tank-mix with residual herbicides when using the 1 quart per acre rate. | | | |
| **Smartweed, swamp** | **3 - 5** | **3 - 40** | **2%** |
| Apply when most plants have reached the early bud stage of growth.<br><br>Also for control, apply 16 fluid ounces of Glypro Plus plus 0.5 pound a.i. of 2,4-D in 3 to 10 gallons of water per acre in the late summer or fall. | | | |
| **Sowthistle, perennial** | **2 - 3** | **3 - 40** | **2%** |
| Apply when most plants are at or beyond the bud stage of growth. After harvest, mowing or tillage in the late summer or fall, allow at least 4 weeks for initiation of active growth and rosette development prior to the application of this product. Fall treatments must be applied before a killing frost. Allow 3 or more days after application before tillage. | | | |
| **Spurge, leafy** | **-** | **3 - 10** | **2%** |
| For suppression, apply 16 fluid ounces of Glypro Plus plus 0.5 pound a.i. 2,4-D in 3 to 10 gallons of water per acre in the late summer or fall. If mowing has occurred prior to treatment, apply when most of the plants are 12 inches tall. | | | |
| **Starthistle, yellow** | **2** | **10 - 40** | **2%** |
| Best results are obtained when applications are made during the rosette, bolting and early flower stages. | | | |
| **Sweet potato, wild** | **-** | **-** | **2%** |
| Partial control. Apply to plants that are at or beyond the bloom stage of growth. Repeat applications may be required. | | | |
| **Thistle, artichoke** | **-** | **-** | **2%** |
| Partial control. Apply to plants that are at or beyond the bloom stage of growth. Repeat applications may be required. | | | |
| **Thistle, Canada** | **2 - 3** | **3 - 40** | **2%** |
| Apply when most plants are at or beyond the bud stage of growth. After harvest, mowing or tillage in the late summer or fall, allow at least 4 weeks for initiation of active growth and rosette development prior to the application of Glypro Plus. Fall treatments must be applied before a killing frost. Allow 3 or more days after application before tillage.<br><br>For suppression, apply 1 quart of Glypro Plus, or 1 pint of Glypro Plus plus 0.5 pound a.i. 2,4-D, in 3 to 10 gallons of water per acre in the late summer or fall after harvest, mowing or tillage. Allow rosette regrowth to a minimum of 6 inches in diameter before treating. Applications can be made as long as leaves are still green and plants are actively growing at the time of application. Allow 3 or more days after application before tillage. | | | |
| **Timothy** | **2 - 3** | **3 - 40** | **2%** |
| For best results, apply when most plants have reached the boot-to-head stage of growth. | | | |
| **Torpedograss** | **4 - 5** | **3 - 40** | **2%** |
| For partial control. Apply when most plants are at or beyond the seedhead stage of growth. Repeat applications will be required to maintain control. Fall treatments must be applied before frost. | | | |
| **Trumpetcreeper** | **2** | **5 - 10** | **2%** |
| Partial control. Apply in late September or October, to plants that are at least 18 inches tall and have been growing 45 to 60 days since the last tillage operation. Make applications at least 1 week before a killing frost. | | | |
| **Vaseygrass** | **3 - 5** | **3 - 20** | **2%** |
| Apply when most plants are in the early head stage. | | | |
| **Velvetgrass** | **3 - 5** | **3 - 20** | **2%** |
| Apply when most plants are in the early head stage. | | | |
| **Wheatgrass, western** | **2 - 3** | **3 - 40** | **2%** |
| For best results, apply when most plants have reached the boot-to-head stage of growth. | | | |

## Woody Brush And Trees Rate Table (Alphabetically By Species)

Apply Glypro Plus after full leaf expansion, unless otherwise directed. Use the higher rate for larger plants and/or dense areas of growth. On vines, use the higher rate for plants that have reached the woody stage of growth. Best results are obtained when application is made in late summer or fall after fruit formation.

In arid areas, best results are obtained when applications are made in the spring to early summer when brush species are at high moisture content and are flowering.

Ensure thorough coverage when using hand-held equipment. Symptoms may not appear prior to frost or senescence with fall treatments.

Allow 7 or more days after application before tillage, mowing or removal. Repeat treatments may be necessary to control plants regenerating from underground parts or seed. Some autumn colors on undesirable deciduous species are acceptable provided no major leaf drop has occurred. Reduced performance may result if fall treatments are made following a frost.

For difficult to control perennial weeds and woody brush and trees, where plants are growing under stressed conditions, or where infestations are dense, Glypro Plus may be used at 5 to 10 quarts per acre for enhanced results. The annual maximum use rate for Glypro Plus is 10.6 qt per acre per year.

| Weed Species | Rate (qt/acre) | Water Volume (gpa) | Hand-Held (% Solution) |
|---|---|---|---|
| **Alder** | **3 - 4** | **3 - 40** | **1 - 1.5%** |
| For control | | | |
| **Ash** | **2 - 5** | **3 - 40** | **1 - 2%** |
| Partial control | | | |
| **Aspen, quaking** | **2 - 3** | **3 - 40** | **1 - 1.5%** |
| For control | | | |
| **Bearmat (Bearclover)** | **2 - 5** | **3 - 40** | **1 - 2%** |
| For partial control | | | |
| **Beech** | **2 - 5** | **3 - 40** | **1 - 2%** |
| Partial control | | | |
| **Birch** | **2** | **3 - 40** | **1%** |
| For control | | | |
| **Blackberry** | **3 - 4** | **10 - 40** | **1 - 1.5%** |
| For control. Make applications after plants have reached full leaf maturity. Best results are obtained when applications are made in late summer or fall. Applications may also be made after leaf drop and until a killing frost or as long as stems are green. After berries have set or dropped in late fall, blackberry can be controlled by applying a 3/4 percent solution of Glypro Plus. For control of blackberries after leaf drop and until killing frost or as long as stems are green, apply 3 to 4 quarts of Glypro Plus in 10 to 40 gallons of water per acre. | | | |
| **Blackgum** | **2 - 5** | **3 - 40** | **1 - 2%** |
| For control | | | |
| **Bracken** | **2 - 5** | **3 - 40** | **1 - 2%** |
| For control | | | |
| **Broom; French, Scotch** | **-** | **-** | **1.5 - 2%** |
| For control | | | |
| **Buckwheat, California** | **-** | **-** | **1 - 2%** |
| For partial control. Thorough coverage of foliage is necessary for best results. | | | |
| **Cascara** | **2 - 5** | **3 - 40** | **1 - 2%** |
| Partial control | | | |
| **Catsclaw** | **-** | **-** | **1 - 1.5%** |
| Partial control | | | |
| **Ceanothus** | **2 - 5** | **3 - 40** | **1 - 2%** |
| Partial control | | | |
| **Chamise** | **-** | **-** | **1%** |
| For control. Thorough coverage of foliage is necessary for best results. | | | |
| **Cherry; bitter, black, pin** | **2 - 3** | **3 - 40** | **1 - 1.5%** |
| For control | | | |
| **Coyote brush** | **-** | **-** | **1 - 1.5%** |
| For control. Apply when at least 50 percent of the new leaves are fully developed. | | | |

| Weed Species | Rate (qt/acre) | Water Volume (gpa) | Hand-Held (% Solution) |
|---|---|---|---|
| **Dogwood** | **2 - 5** | **3 - 40** | **1 - 2%** |
| Partial control | | | |
| **Elderberry** | **2** | **3 - 40** | **1%** |
| For control | | | |
| **Elm** | **2 - 5** | **3 - 40** | **1 - 2%** |
| Partial control | | | |
| **Eucalyptus** | **-** | **-** | **2%** |
| For control of eucalyptus resprouts, apply when resprouts are 6 to 12 feet tall. Ensure complete coverage. Avoid application to drought-stressed plants. | | | |
| **Florida holly (Brazilian Peppertree)** | **2 - 5** | **3 - 40** | **1 - 2%** |
| Partial control | | | |
| **Gorse** | **2 - 5** | **3 - 40** | **1 - 2%** |
| Partial control | | | |
| **Hasardia** | **-** | **-** | **1 - 2%** |
| Partial control. Thorough coverage of foliage is necessary for best results. | | | |
| **Hawthorn** | **2 - 3** | **3 - 40** | **1 - 1.5%** |
| For control | | | |
| **Hazel** | **2** | **3 - 40** | **1%** |
| For control | | | |
| **Hickory** | **2 - 5** | **3 - 40** | **1 - 2%** |
| Partial control | | | |
| **Honeysuckle** | **3 - 4** | **3 - 40** | **1 - 1.5%** |
| For control | | | |
| **Hornbeam, American** | **2 - 5** | **3 - 40** | **1 - 2%** |
| Partial control | | | |
| **Kudzu** | **4** | **3 - 40** | **2%** |
| For control. Repeat applications may be required to maintain control. | | | |
| **Locust, black** | **2 - 4** | **3 - 40** | **1 - 2%** |
| Partial control | | | |
| **Madrone resprouts** | **-** | **-** | **2%** |
| Partial control. Apply to resprouts that are 3 to 6 feet tall. Best results are obtained with spring/early summer treatments. | | | |
| **Manzanita** | **2 - 5** | **3 - 40** | **1 - 2%** |
| Partial control | | | |
| **Maple, red** | **2 - 4** | **3 - 40** | **1 - 1.5%** |
| For control, apply a 1 to 1.5 percent solution when at least 50 percent of the new leaves are fully developed. For partial control, apply 2 to 4 quarts of Glypro Plus per acre. | | | |
| **Maple, sugar** | **-** | **-** | **1 - 1.5%** |
| For control. Apply when at least 50 percent of the new leaves are fully developed. | | | |
| **Monkey flower** | **-** | **-** | **1 - 2%** |
| Partial control. Thorough coverage of foliage is necessary for best results. | | | |
| **Oak; black, white** | **2 - 4** | **3 - 40** | **1 - 2%** |
| Partial control | | | |
| **Oak, post** | **3 - 4** | **3 - 40** | **1 - 1.5%** |
| For control | | | |
| **Oak; northern, pin** | **-** | **-** | **1 - 1.5%** |
| For control. Apply when at least 50 percent of the new leaves are fully developed. | | | |
| **Oak; southern red** | **2 - 3** | **3 - 40** | **1 - 1.5%** |
| For control | | | |
| **Persimmon** | **2 - 5** | **3 - 40** | **1 - 2%** |
| Partial control | | | |
| **Pine** | **2 - 5** | **3 - 40** | **1 - 2%** |
| For control | | | |
| **Poison ivy/ Poison oak** | **4 - 5** | **3 - 40** | **1 - 2%** |
| For control. Repeat applications may be required to maintain control. Fall treatments must be applied before leaves lose green color. | | | |

| Weed Species | Rate (qt/acre) | Water Volume (gpa) | Hand-Held (% Solution) |
|---|---|---|---|
| **Poplar, yellow** | **2 - 5** | **3 - 40** | **1 - 2%** |
| Partial control | | | |
| **Redbud, eastern** | **2 - 5** | **3 - 40** | **1 - 2%** |
| For control | | | |
| **Rose, multiflora** | **2** | **3 - 40** | **1%** |
| For control. Treatments should be made prior to leaf deterioration by leaf-eating insects. | | | |
| **Russian olive** | **2 - 5** | **3 - 40** | **1 - 2%** |
| Partial control | | | |
| **Sage, black** | **-** | **-** | **1%** |
| For control. Thorough coverage of foliage is necessary for best results. | | | |
| **Sage, white** | **2 - 5** | **3 - 40** | **1 - 2%** |
| Partial control | | | |
| **Sage brush, California** | **-** | **-** | **1%** |
| For control. Thorough coverage of foliage is necessary for best results. | | | |
| **Salmonberry** | **2** | **3 - 40** | **1%** |
| For control | | | |
| **Salt-cedar** | **2 - 5** | **3 - 40** | **1 - 2%** |
| For control | | | |
| **Sassafras** | **2 - 5** | **3 - 40** | **1 - 2%** |
| Partial control | | | |
| **Sourwood** | **2 - 5** | **3 - 40** | **1 - 2%** |
| Partial control | | | |
| **Sumac; poison, smooth, winged** | **2 - 4** | **3 - 40** | **1 - 2%** |
| Partial control | | | |
| **Sweetgum** | **2 - 3** | **3 - 40** | **1 - 1.5%** |
| For control | | | |
| **Swordfern** | **2 - 5** | **3 - 40** | **1 - 2%** |
| Partial control | | | |
| **Tallowtree, Chinese** | **-** | **-** | **1%** |
| For control. Thorough coverage of foliage is necessary for best results. | | | |
| **Tan oak resprouts** | **-** | **-** | **2%** |
| For partial control. Apply to resprouts that are less than 3 to 6 feet tall. Best results are obtained with fall applications. | | | |
| **Thimbleberry** | **2** | **3 - 40** | **1%** |
| For control | | | |
| **Tobacco, tree** | **-** | **-** | **1 - 2%** |
| Partial control | | | |
| **Trumpetcreeper** | **2 - 3** | **3 - 40** | **1 - 1.5%** |
| For control | | | |
| **Vine maple** | **2 - 5** | **3 - 40** | **1 - 2%** |
| Partial control | | | |
| **Virginia creeper** | **2 - 5** | **3 - 40** | **1 - 2%** |
| For control | | | |
| **Waxmyrtle, southern** | **2 - 5** | **3 - 40** | **1 - 2%** |
| Partial control | | | |
| **Willow** | **3** | **3 - 40** | **1%** |
| For control | | | |

## Terms and Conditions of Use

**If terms of the following Warranty Disclaimer, Inherent Risks of Use, and Limitation of Remedies are not acceptable, return unopened package at once to the seller for a full refund of purchase price paid. Otherwise, use by the buyer or any other user constitutes acceptance of the terms under Warranty Disclaimer, Inherent Risks of Use and Limitations of Remedies.**

## Warranty Disclaimer

Dow AgroSciences warrants that Glypro Plus conforms to the chemical description on the label and is reasonably fit for the purposes stated on the label when used in strict accordance with the directions, subject to the inherent risks set forth below. Dow AgroSciences MAKES NO OTHER EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER EXPRESS OR IMPLIED WARRANTY.

## Inherent Risks of Use

It is impossible to eliminate all risks associated with use of Glypro Plus. Crop injury, lack of performance, or other unintended consequences may result because of such factors as use of the product contrary to label instructions (including conditions noted on the label, such as unfavorable temperatures, soil conditions, etc.), abnormal conditions (such as excessive rainfall, drought, tornadoes, hurricanes), presence of other materials, the manner of application, or other factors, all of which are beyond the control of Dow AgroSciences or the seller. All such risks shall be assumed by buyer.

## Limitation of Remedies

The exclusive remedy for losses or damages resulting from Glypro Plus (including claims based on contract, negligence, strict liability, or other legal theories), shall be limited to, at Dow AgroSciences' election, one of the following:

(1) Refund of purchase price paid by buyer or user for product bought, or
(2) Replacement of amount of product used.

Dow AgroSciences shall not be liable for losses or damages resulting from handling or use of Glypro Plus unless Dow AgroSciences is promptly notified of such loss or damage in writing. In no case shall Dow AgroSciences be liable for consequential or incidental damages or losses.

The terms of the Warranty Disclaimer and Inherent Risks of Use above and this Limitation of Remedies cannot be varied by any written or verbal statements or agreements. No employee or sales agent of Dow AgroSciences or the seller is authorized to vary or exceed the terms of the Warranty Disclaimer or this Limitation of Remedies in any manner.

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EPA-accepted 03/29/2001

Label Cdoe: D02-095-003
Replaces Label: D02-095-002
LOES Number: 010-00078

**Revisions:**

1. Addition of use for Forest Site Preparation.

# MATERIAL SAFETY DATA SHEET

**Emergency Phone: 800-992-5994**
**Dow AgroSciences LLC**
**Indianapolis, IN 46268**

## GLYPRO* PLUS HERBICIDE

Effective Date: 4/9/02
Product Code: 74372
MSDS: 006692

### 1. PRODUCT AND COMPANY IDENTIFICATION:

**PRODUCT:** Glypro* Plus Herbicide

**COMPANY IDENTIFICATION:**
Dow AgroSciences
9330 Zionsville Road
Indianapolis, IN 46268-1189

### 2. COMPOSITION/INFORMATION ON INGREDIENTS:

| | | |
|---|---|---|
| Glyphosate: N-(phosphono-methyl)glycine, Isopropylamine Salt | CAS # 038641-94-0 | 41% |
| Inert Ingredients, Total | | 59% |

This document is prepared pursuant to the OSHA Hazard Communication Standard (29 CFR 1910.1200). In addition, other substances not 'Hazardous' per this OSHA Standard may be listed. Where proprietary ingredient shows, the identity may be made available as provided in this standard.

### 3. HAZARDOUS IDENTIFICATIONS:

**EMERGENCY OVERVIEW**

Hazardous Chemical. Clear amber liquid. May cause eye irritation. $LD_{50}$ for skin absorption in rabbits is >5000 mg/kg. Oral $LD_{50}$ for rats is >5000 mg/kg. Aerosol $LC_{50}$ for rats is >5.00 mg/L for 4 hrs.
**EMERGENCY PHONE NUMBER:** 800-992-5994

**POTENTIAL HEALTH EFFECTS:** This section includes possible adverse effects, which could occur if this material is not handled in the recommended manner.

**EYE:** May cause slight eye irritation. Corneal injury is unlikely.

**SKIN:** Essentially non-irritating to the skin. Prolonged skin contact is unlikely to result in absorption of harmful amounts. The $LD_{50}$ for skin absorption in rabbits is >5000 mg/kg. Did not cause allergic skin reactions when tested in guinea pigs.

**INGESTION:** Very low toxicity if swallowed. Harmful effects not anticipated from swallowing small amounts. The oral $LD_{50}$ for rats is >5000 mg/kg.

**INHALATION:** Brief exposure (minutes) is not likely to cause adverse effects. The aerosol $LC_{50}$ for rats is >5.00 mg/L for 4 hours.

**SYSTEMIC (OTHER TARGET ORGAN) EFFECTS:** For the active ingredient, in animals, effects have been reported on the following organ: liver.

**CANCER INFORMATION:** The active ingredient did not cause cancer in laboratory animals.

**TERATOLOGY (BIRTH DEFECTS):** For the active ingredient, birth defects are unlikely. Exposures having no effect on the mother should have no effect on the fetus. Did not cause birth defects in animals; other effects were seen in the fetus only at doses which caused toxic effects to the mother.

**REPRODUCTIVE EFFECTS:** For the active ingredient, in laboratory animal studies, effects on reproduction have been seen only at doses that produced significant toxicity to the parent animals.

### 4. FIRST AID:

**EYE**: Flush eyes thoroughly with water for several minutes. Remove contact lenses after initial 1-2 minutes and continue flushing for several additional minutes. If effects occur, consult a physician, preferably an ophthalmologist.

**SKIN:** Wash skin with plenty of water.

**INGESTION:** No emergency medical treatment necessary.

**INHALATION:** Move person to fresh air; if effects occur, consult a physician.

**NOTE TO PHYSICIAN:** No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

### 5. FIRE FIGHTING MEASURES:

**FLASH POINT:** >235°F (>112°C)
**METHOD USED:** Setaflash

**FLAMMABLE LIMITS:**
LFL: Not applicable
UFL: Not applicable

**EXTINGUISHING MEDIA:** Foam, $CO_2$, or Dry Chemical

**FIRE AND EXPLOSION HAZARDS**: Foam fire extinguishing system is preferred because uncontrolled water can spread possible contamination. Toxic irritating gases may be formed under fire conditions.


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**FIRE-FIGHTING EQUIPMENT:** Use positive-pressure, self-contained breathing apparatus and full protective equipment.

### 6. ACCIDENTAL RELEASE MEASURES:

**ACTION TO TAKE FOR SPILLS:** Absorb small spills with an inert absorbent material such as Hazorb, Zorball, sand, or dirt. Report large spills to Dow AgroSciences on 800-992-5994.

### 7. HANDLING AND STORAGE:

**PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:** Keep out of reach of children. Do not swallow. Avoid contact with eyes, skin, and clothing. Avoid breathing vapors and spray mist. Handle concentrate in ventilated area. Wash thoroughly with soap and water after handling and before eating, chewing gum, using tobacco, using the toilet or smoking. Keep away from food, feedstuffs, and water supplies. Store in original container with the lid tightly closed.

### 8. EXPOSURE CONTROLS/PERSONAL PROTECTION:

These precautions are suggested for conditions where the potential for exposure exists. Emergency conditions may require additional precautions.

**EXPOSURE GUIDELINES**: None established

**ENGINEERING CONTROLS**: Good general ventilation should be sufficient for most conditions. Local exhaust ventilation may be necessary for some operations.

**RECOMMENDATIONS FOR MANUFACTURING, COMMERCIAL BLENDING, AND PACKAGING WORKERS:**

**EYE/FACE PROTECTION**: Use safety glasses.

**SKIN PROTECTION:** No precautions other than clean body-covering clothing should be needed.

**RESPIRATORY PROTECTION**: For most conditions, no respiratory protection should be needed; however, if discomfort is experienced, use a NIOSH approved air-purifying respirator.

**APPLICATIONS AND ALL OTHER HANDLERS**: Refer to the product label for personal protective clothing and equipment.

### 9. PHYSICAL AND CHEMICAL PROPERTIES:

**APPEARANCE:** Clear amber liquid
**DENSITY**: 9.7 - 9.8 lbs./gallon
**ODOR**: None
**SOLUBILITY IN WATER**: Miscible
**SPECIFIC GRAVITY**: 1.17 gm/L
**pH**: 4.8 - 5.0
**FREEZING POINT**: -14°F - -16°F (-25°C - -26°C)

### 10. STABILITY AND REACTIVITY:

**STABILITY:** (CONDITIONS TO AVOID) Stable under normal storage conditions.

**INCOMPATIBILITY:** (SPECIFIC MATERIALS TO AVOID) Galvanized or unlined steel (except stainless steel) containers or spray tanks may produce hydrogen gas which may form a highly combustible gas mixture.

**HAZARDOUS DECOMPOSITION PRODUCTS**: None known

**HAZARDOUS POLYMERIZATION:** Not known to occur.

### 11. TOXICOLOGICAL INFORMATION:

**MUTAGENICITY:** Animal mutagenicity studies were negative.

### 12. ECOLOGICAL INFORMATION:

**ENVIRONMENTAL FATE:**

**MOVEMENT & PARTITIONING:**
Based largely or completely on information for glyphosate.
Bioconcentration potential is low (BCF <100 or Log Pow <3).
Expected to be relatively immobile in soil (Koc >5000).

**DEGRADATION & PERSISTENCE:**
Based largely or completely on information for glyphosate.
Degradation is expected in the soil environment.



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ECOTOXICOLOGY:
Material is practically non-toxic to aquatic organisms on an acute basis ($LC_{50}/EC_{50}$ >100 mg/L in the most sensitive species tested).
Acute $LC_{50}$ in rainbow trout *(Oncorhynchus mykiss)* is 109 mg/L.
Acute immobilization $EC_{50}$ in water flea *(Daphnia magna)* is 105 mg/L.
Material is practically non-toxic to birds on an acute basis ($LD_{50}$ is >2000 mg/kg).
Acute oral $LD_{50}$ in bobwhite *(Colinus virginianus)* is >2000 mg/kg.
The $LC_{50}$ in earthworm *(Eisenia foetida)* is >1000 mg/kg.
Acute contact $LD_{50}$ in honeybee *(Apis mellifera)* is >100 µg/bee.
Acute oral $LD_{50}$ in honeybee *(Apis mellifera)* is >100 µg/bee.
Growth inhibition $EC_{50}$ in green alga *(Selenastrum capricornutum)* is 2.50 mg/L.
Growth inhibition $EC_{50}$ in duckweed *(Lemna sp.)* is 48.4 mg/L.

### 13. DISPOSAL CONSIDERATIONS:

**DISPOSAL METHOD:** Do not contaminate water, food, or feed by storage or disposal. Excess wastes resulting from the use of this product may be disposed of on site according to label directions or at an approved waste disposal facility. Follow all local, state, and federal requirements for disposal.

### 14. TRANSPORT INFORMATION:

**U.S. DEPARTMENT OF TRANSPORTATION INFORMATION:**

For all package sizes and modes of transportation:
This material is not regulated for transportation.

### 15. REGULATORY INFORMATION:

**NOTICE:** The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state or provincial, and local laws. The following specific information is made for the purpose of complying with numerous federal, state or provincial, and local laws and regulations.

**U.S. REGULATIONS**

**SARA 313 INFORMATION**: To the best of our knowledge, this product contains no chemical subject to SARA Title III Section 313 supplier notification requirements.

**SARA HAZARD CATEGORY:** This product has been reviewed according to the EPA "Hazard Categories" promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

An immediate health hazard
A delayed health hazard

**TOXIC SUBSTANCES CONTROL ACT (TSCA):** All ingredients are on the TSCA inventory or are not required to be listed on the TSCA inventory.

**STATE RIGHT-TO-KNOW:** This product is not known to contain any substances subject to the disclosure requirements of

New Jersey
Pennsylvania

**OSHA HAZARD COMMUNICATION STANDARD:** This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

**NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) RATINGS:**

| | |
|---|---|
| Health | 1 |
| Flammability | 1 |
| Reactivity | 0 |


*Trademark of Dow AgroSciences

Dow AgroSciences

**Emergency Phone: 800-992-5994**
**Dow AgroSciences LLC**
**Indianapolis, IN 46268**


## GLYPRO* PLUS HERBICIDE

Effective Date: 4/9/02
Product Code: 74372
MSDS: 006692

**COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILITY ACT (CERCLA, or SUPERFUND):** To the best of our knowledge, this product contains no chemical subject to reporting under CERCLA.

**16. OTHER INFORMATION:**

**MSDS STATUS**: Revised Sections: 3, 4, 12, 14, & 15
Reference: DR-0361-6226
Replaces Document Dated: 1/12/00
Document Code: D03-095-002
Replaces Document Code: D03-095-001

The Information Herein Is Given In Good Faith, But No Warranty, Express or Implied, Is Made. Consult Dow AgroSciences for Further Information.



*Trademark of Dow AgroSciences

# Ramik® Mini Bars

## ALL-WEATHER RAT AND MOUSE KILLER

**• Mold and Moisture Resistant**

**KILLS NORWAY RATS, ROOF RATS and HOUSE MICE in WET or DRY AREAS**

| | |
|---|---|
| **ACTIVE INGREDIENT:** | |
| Diphacinone (2-Diphenylacetyl-1,3-Indandione) | 0.005% |
| **INERT INGREDIENTS:** | 99.995% |
| **TOTAL:** | 100.000% |

EPA Reg. No. 61282-26 EPA Est. No. 61282-WI-1

**KEEP OUT OF REACH OF CHILDREN**

**CAUTION**

**See additional Precautionary Statements on Side Panel**

For a Medical Emergency involving this product call **1-800-498-5743**

**FIRST AID**

Have label with you when obtaining treatment advice.

| | |
|---|---|
| If Swallowed | • Call a poison control center, doctor or 1-800-498-5743 immediately for treatment advice.<br>• Have person sip a glass of water if able to swallow<br>• Do not induce vomiting unless told to do so by the poison control center or doctor. |

**NOTE TO PHYSICIAN:** If ingested, administer Vitamin $K_1$, intramuscularly or orally as indicated in bishydroxycoumarin overdose. Repeat as necessary based on monitoring of prothrombin times.

### PRECAUTIONARY STATEMENTS

### HAZARDS TO HUMANS AND DOMESTIC ANIMALS

**CAUTION:** Keep away from humans, domestic animals, and pets. If swallowed, this material may reduce the clotting ability of the blood and cause bleeding.

### ENVIRONMENTAL HAZARDS

This product is toxic to mammals and birds. Do not apply this product directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark.

### DIRECTIONS FOR USE

It is a violation of federal law to use this product in a manner inconsistent with its labeling.

**READ THIS LABEL:** Read this entire label and follow all use directions and use precautions.

**IMPORTANT:** Do not expose children, pets, or other non-target animals to rodenticides. To help to prevent accidents:

1. Store product not in use in a location out of reach of children and pets.
2. Apply bait in locations out of reach of children, pets, domestic animals and non-target wildlife, or in tamper-and resistant bait stations. These stations must be resistant to destruction by dogs and by children under six years of age, must be used in a manner that prevents such children from reaching into bait compartments and obtaining bait. If bait can be shaken from stations when they are lifted, units must be secured or otherwise immobilized. Even stronger bait stations are needed in areas open to hoofed livestock, raccoons, bears, or other potentially destructive animals, or in areas prone to vandalism.
3. Dispose of product container, and unused, spoiled, and unconsumed bait as specified on this label.

**USE RESTRICTIONS:** For control of Norway rats, roof rats and house mice in and around homes, industrial and agricultural buildings, and similar man-made structures. This product is especially suited for use in wet or damp areas, including river banks, gullies, irrigation ditches, sewers, garbage dumps, and landfills.

Do not place bait in areas where there is a possibility of contaminating food or surfaces that come in direct contact with food. Do not apply bait directly to ground surface or in grass or other ground cover.

**SELECTION OF TREATMENT AREAS:** Determine areas where rats or mice will most likely find and consume the bait. Generally, these are along walls, by gnawed openings, in or beside burrows, in corners and concealed places, between floors and walls, or in locations where rodents or their signs have been seen. Protect bait from rain or snow. Remove as much alternative food as possible.

**APPLICATION DIRECTIONS:** Each Ramik Mini Bar weighs approximately one ounce.

**RATS:** Apply 4 to 16 Ramik Mini Bars (usually at intervals of 15 to 30 feet) per placement. Maintain an uninterrupted supply of fresh bait for at least 10 days or until signs of rat activity cease.

**MICE:** Place one 1-ounce Ramik Mini Bar at each placement location. Space placements at 8 to 12-foot intervals. Two 1-ounce pieces may be needed at points of very high mouse activity. Maintain an uninterrupted supply of fresh bait for at least 15 days or until signs of mouse activity cease.

**RATS AND MICE:** Replace contaminated or spoiled bait immediately. Collect and dispose of all dead animals and leftover bait properly. To prevent reinfestation, limit sources of rodent food, water, and harborage as much as possible. If reinfestation does occur, repeat treatment. Where a continuous source of infestation is present, establish permanent bait stations and replenish as needed.

This specimen label is intended for use only as a guide in providing general information regarding the directions, warning and cautions associated with the use of this product. As with any rodenticide, always follow the label instructions on the package before using.

## STORAGE AND DISPOSAL

Do not contaminate water, food, or feed by storage or disposal.

**STORAGE:** Store only in original closed container in a cool, dry place inaccessible to children and pets. Store separately from fertilizer and away from products with strong odors which may contaminate the bait and reduce acceptability. Sweep up spillage carefully and collect for disposal.

**PESTICIDE DISPOSAL:** Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

**CONTAINER DISPOSAL: Commercial Use:** Dispose of empty container in a sanitary landfill, or by incineration, or, if allowed by State and local authorities, by burning. If burned, stay out of smoke.

**Household Use Disposal – If empty:** Do not reuse empty container. Place in trash or offer for recycling if available.

**If partly filled:** Call your local solid waste agency for disposal instructions. Never place unused product down any indoor or outdoor drain.

## CONDITIONS OF SALE AND LIMITATION OF WARRANTY AND LIABILITY

**NOTICE: Read the entire Directions for Use and Conditions of Sale and Limitation of Warranty and Liability before buying or using this product. If the terms are not acceptable, return the product at once, unopened, and the purchase price will be refunded.**

Manufacturer and Seller warrant that this product conforms to the chemical description on the label and is reasonably fit for the purposes stated in the Directions for Use, subject to the inherent risks referred to above, when used in accordance with directions under normal use conditions. This warranty does not extend to the use of this product contrary to label instructions, or under abnormal conditions or under conditions not reasonably foreseeable to or beyond the control of Seller or Manufacturer, and Buyer and User assume the risk of any such use. MANUFACTURER AND SELLER MAKE NO WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE NOR ANY OTHER EXPRESS OR IMPLIED WARRANTY EXCEPT AS STATED ABOVE.

IN NO EVENT SHALL MANUFACTURER OR SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES RESULTING FROM THE USE OR HANDLING OF THIS PRODUCT. THE EXCLUSIVE REMEDY OF THE USER OR BUYER, AND THE EXCLUSIVE LIABILITY OF MANUFACTURER AND SELLER FOR ANY AND ALL CLAIMS, LOSSES, INJURIES OR DAMAGES (INCLUDING CLAIMS BASED ON BREACH OF WARRANTY, CONTRACT, NEGLIGENCE, TORT, STRICT LIABILITY OR OTHERWISE) RESULTING FROM THE USE OR HANDLING OF THIS PRODUCT, SHALL BE THE RETURN OF THE PURCHASE PRICE OF THE PRODUCT OR, AT THE ELECTION OF MANUFACTURER OR SELLER, THE REPLACEMENT OF THE PRODUCT.

Manufacturer and Seller offer this product, and Buyer and User accept it, subject to the foregoing conditions of sale and limitations of warranty and of liability, which may not be modified except by written agreement signed by a duly authorized representative of Manufacturer.

For non-emergency (e.g. current product information) call **1-800-621-8829**.

Hacco, Inc.
PO Box 7190
Madison, WI 53707



This specimen label is intended for use only as a guide in providing general information regarding the directions, warning and cautions associated with the use of this product. As with any rodenticide, always follow the label instructions on the package before using.

# RAMIK® Mini BARS ALL-WEATHER Rat & Mouse KILLER

## MATERIAL SAFETY DATA SHEET

Product Name: RAMIK® Mini BARS ALL-WEATHER Rat & Mouse KILLER

EPA Registration No. 61282-26

### SECTION I

Manufacturer's Name: HACCO, INC.
P.O. Box 7190
Madison, Wisconsin 53707
For product information: 608-221-6200 (Madison Registration office)
920-326-5141 (Manufacturing location)

Emergency Phone Numbers: 800-424-9300 CHEMTREC

For Medical Emergencies
Related to this Product: 800-301-7976

Date Updated: October, 2003

### SECTION II - Hazardous Ingredients / Identity Information

| Specific Chemical Identity | OSHA PEL | ACGIH TLV | Other Limits Recommended | % Ingr. |
|---|---|---|---|---|
| Diphacinone (CAS No. 82-66-6) | N/A | N/A | N/A | 0.005 |
| Inert Ingredients: (Non-hazardous) Grain, flavorings, etc. | N/A | N/A | N/A | 99.995 |

THIS PRODUCT CONTAINS THE FOLLOWING SUBSTANCE WHICH IS REGULATED UNDER SARA, TITLE III, SECT. 313: None.

### SECTION III - Physical / Chemical Characteristics

| | |
|---|---|
| Boiling Point: | N/A |
| Specific Gravity (water = 1) | Bulk Density = 63 lb/cu ft |
| Vapor Pressure (mm Hg) | N/A |
| Vapor Density (air=1) | N/A |
| Melting Point: | N/A |
| Evaporation Rate (Butyl Acetate=1) | N/A |
| Solubility in Water: | Not soluble. |
| Appearance and Odor: | Rectangular block, with wax odor |

### SECTION IV - Fire and Explosion Hazard Data

Flash Point: N/A
Flammability Limits: UEL: N/A LEL: N/A

Extinguishing Media: Fog or water spray, foam, carbon dioxide, dry chemical.

Special Fire Fighting Procedures: Potentially hazardous in fire. Wear self-contained breathing apparatus. If water is used as an extinguishing media, diking is required to keep contaminated water out of all water supplies.

Unusual Fire and Explosion Hazards: None.

N/A = Not Available

# RAMIK® Mini BARS ALL-WEATHER Rat & Mouse KILLER

### SECTION V - Reactivity Data

Stability: This is a stable product.
Conditions to avoid: None known.

Incompatibility (Materials to Avoid): None known.

Hazardous Decomposition Products: None known.

Hazardous Polymerization: Does not occur.
Conditions to avoid: None known.

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### SECTION VI - Health Hazard Data

| | | |
|---|---|---|
| Routes of Entry: | Inhalation? | No. |
| | Skin? | No. |
| | Ingestion? | Yes. |

Health Hazards (Acute and Chronic): Inhibition of formation of prothrombin and reduction of clotting of blood. Acute Oral $LD_{50}$ = 7 mg/kg (rats) for Diphacinone Technical at 98% Active Ingredient. (Equivalent to approximately 100,000 mg/kg of RAMIK Mini BARS ALL-WEATHER Rat & Mouse KILLER)

| | | |
|---|---|---|
| Carcinogenicity: | NTP? | No. |
| | IARC Monographs? | No. |
| | OSHA Regulated? | No. |

Signs and Symptoms of Exposure: Normal reaction to anticoagulant: Nose bleeding, bleeding gums.

Medical Conditions Generally Aggravated by Exposure: Bleeding and other conditions which may be aggravated by extended clotting time.

Emergency and First Aid Procedures: INGESTION: CALL PHYSICIAN OR POISON CONTROL CENTER IMMEDIATELY. Administration of Vitamin $K_1$ combined with blood transfusions, is indicated as in the case of hemorrhage caused by overdose of bishydroxycoumarin (Dicumarol). Repeat treatment as necessary based on prothrombin times.

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### SECTION VII - Precautions for Safe Handling and Use

Steps to Be Taken in Case Material is Released or Spilled: Sweep up, place in container and seal.

Waste Disposal Method: Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

Precautions to Be Taken In Handling and Storing: Store in original container in a well ventilated area separately from fertilizer, feed or foodstuffs and away from products with strong odors. Avoid cross-contamination with other pesticides.

Other Precautions: Keep in area suitable for pesticide storage. Keep out of reach of children and domestic animals.

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### SECTION VIII - Control Measures

| | | |
|---|---|---|
| Respiratory Protection (specify type): | | Not generally required. |
| Ventilation: | Local Exhaust? | Not generally required. |
| | Mechanical (general)? | Not generally required. |
| | Special? | Not generally required. |
| | Other? | Not generally required. |

# RAMIK® Mini BARS ALL-WEATHER Rat & Mouse KILLER

**SECTION VIII - Control Measures (cont.)**

Protective Gloves: None.

Eye Protection: Not generally required.

Other Protective Clothing or Equipment: Use clothing and equipment consistent with good pesticide handling and application procedures.

Work/Hygienic Practices: Wash thoroughly after handling product.

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**SECTION IX - California Addendum (Proposition 65) Safe Drinking Water and Toxic Enforcement Act of 1986**

The following specific warnings are hereby given relative to substances that the State of California has identified as carcinogens and/or reproductive hazards under Proposition 65:

☐ WARNING: This product contains a chemical known to the State of California to cause cancer. (None)

☐ WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. (None)

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**SECTION X - SARA TITLE III HAZARD CATEGORY:**

For Reporting Under Sections 311 & 312
Exempt for low concentrations of Hazardous ingredient in mixture.

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**SECTION XI - Shipping Information**

D.O.T. Hazard Classification: Not D.O.T. Regulated.
Bill of Lading Description: Vermin Exterminators, NOI



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This sample label is current as of October 5, 2000. The product descriptions and recommendations provided in this sample label are for background information only. Always refer to the label on the product before using Monsanto or any other agrichemical product.

21203Z1-1/CG

Roundup PRO Concentrate

The Complete Broad Spectrum Postemergence Professional Herbicide for Industrial, Turf and Ornamental Weed Control.

# Complete Directions for Use

EPA Reg. No. 524-529

AVOID CONTACT OF HERBICIDE WITH FOLIAGE, GREEN STEMS, EXPOSED NON-WOODY ROOTS OR FRUIT OF CROPS, DESIRABLE PLANTS AND TREES, BECAUSE SEVERE INJURY OR DESTRUCTION IS LIKELY TO RESULT.

Roundup Pro Concentrate is a trademark of Monsanto Technology LLC.

2001-1

Read the entire label before using this product.

Use only according to label instructions.

It is a violation of Federal law to use this product in any manner inconsistent with its labeling.

Not all products recommended on this label are registered for use in California. Check the registration status of each product in California before using.

Read the "LIMIT OF WARRANTY AND LIABILITY" statement at the end of the label before buying or using. If terms are not acceptable, return at once unopened.

THIS IS AN END-USE PRODUCT. MONSANTO DOES NOT INTEND AND HAS NOT REGISTERED IT FOR REFORMULATION. SEE INDIVIDUAL CONTAINER LABEL FOR REPACKAGING LIMITATIONS.

## 1.0 INGREDIENTS

ACTIVE INGREDIENT:

| | |
|---|---|
| *Glyphosate, N-(phosphonomethyl)glycine, in the form of its isopropylamine salt | 50.2% |
| OTHER INGREDIENTS: | 49.8% |
| | 100.0% |

*Contains 600 grams per litre or 5 pounds per U.S. gallon of the active ingredient glyphosate, in the form of its isopropylamine salt.

This product is protected by U.S. Patent Nos. 5,683,958; 5,703,015; 6,063,733; 6,121,199; and 6,121,200. No license granted under any non-U.S. patent(s).

## 2.0 IMPORTANT PHONE NUMBERS

1. FOR PRODUCT INFORMATION OR ASSISTANCE IN USING THIS PRODUCT, CALL TOLL-FREE, 1-800-332-3111.
2. IN CASE OF AN EMERGENCY INVOLVING THIS PRODUCT, OR FOR MEDICAL ASSISTANCE, CALL COLLECT, DAY OR NIGHT, 1-(314)-694-4000.

## 3.0 PRECAUTIONARY STATEMENTS

## 3.1 Hazards to Humans and Domestic Animals

Keep out of reach of children.

CAUTION!

CAUSES MODERATE EYE IRRITATION.
Avoid contact with eyes or clothing.

| FIRST AID | |
|---|---|
| IF IN EYES | Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice. |

| HOT LINE NUMBER |
|---|
| Have the product container or label with you when calling a poison control center or doctor, or going for treatment. This product is identified as Roundup Pro Concentrate™, EPA Registration No. 524-529. You may also contact (314) 694-4000, collect day or night, for emergency medical treatment information. |

DOMESTIC ANIMALS: This product is considered to be relatively nontoxic to dogs and other domestic animals; however, ingestion of this product or large amounts of freshly sprayed vegetation may result in temporary gastrointestinal irritation (vomiting, diarrhea, colic, etc.). If such symptoms are observed, provide the animal with plenty of fluids to prevent dehydration. Call a veterinarian if symptoms persist for more than 24 hours.

**Personal Protective Equipment (PPE)**

**Applicators and other handlers must wear:** long-sleeved shirt and long pants, shoes plus socks. Follow manufacturer's instructions for cleaning/maintaining Personal Protective Equipment (PPE). If there are no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

When handlers use closed systems, enclosed cabs or aircraft in a manner that meets the requirements listed in Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240 (d) (4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

**User Safety Recommendations**

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.

## 3.2 Environmental Hazards

Do not apply directly to water, to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment washwaters.

## 3.3 Physical or Chemical Hazards

Spray solutions of this product should be mixed, stored and applied using only stainless steel, aluminum, fiberglass, plastic or plastic-lined steel containers.

DO NOT MIX, STORE OR APPLY THIS PRODUCT OR SPRAY SOLUTIONS OF THIS PRODUCT IN GALVANIZED STEEL OR UNLINED STEEL (EXCEPT STAINLESS STEEL) CONTAINERS OR SPRAY TANKS. This product or spray solutions of this product react with such containers and tanks to produce hydrogen gas which may form a highly combustible gas mixture. This gas mixture could flash or

explode, causing serious personal injury, if ignited by open flame, spark, welder's torch, lighted cigarette or other ignition source.

## DIRECTIONS FOR USE

It is a violation of Federal law to use this product in any manner inconsistent with its labeling. Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulations.

### Agricultural Use Requirements

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about Personal Protective Equipment (PPE) and restricted entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 4 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil or water, is: coveralls, shoes plus socks and waterproof gloves.

### Non-Agricultural Use Requirements

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard (40 CFR Part 170) for agricultural pesticides. The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries or greenhouses.

Keep people and pets off treated areas until spray solution has dried to prevent transfer of this product onto desirable vegetation.

## 4.0 STORAGE AND DISPOSAL

Do not contaminate water, foodstuffs, feed or seed by storage or disposal.

Keep container closed to prevent spills and contamination.

**DISPOSAL:** Wastes resulting from the use of this product that cannot be used or chemically reprocessed should be disposed of in a landfill approved for pesticide disposal or in accordance with applicable Federal, state, or local procedures.

Emptied container retains vapor and product residue. Observe all labeled safeguards until container is cleaned, reconditioned, or destroyed.

FOR REFILLABLE PORTABLE CONTAINERS: Do not reuse this container except for refill in accordance with a valid Monsanto Repackaging or Toll Repackaging Agreement. If not refilled or returned to the authorized repackaging facility, triple rinse container, then puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

FOR METAL CONTAINERS (non-aerosol): Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities.

FOR BULK CONTAINERS: Triple rinse emptied bulk container. Then offer for recycling or reconditioning, or dispose of in a manner approved by state and local authorities.

FOR PLASTIC 1-WAY CONTAINERS & BOTTLES: Do not reuse container. Triple rinse container, then puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

FOR DRUMS: Do not reuse container. Return container per the Monsanto container return program. If not returned, triple rinse container, then puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

## 5.0 GENERAL INFORMATION

**Product Description:** This product is a postemergent, systemic herbicide with no soil residual activity. It gives broad spectrum control of many annual weeds, perennial weeds, woody brush and trees. It is formulated as a water-soluble liquid containing surfactant.

**Environmental Fate:** When this product comes in contact with the soil it is bound to soil particles. When used in accordance with label directions, once this product is bound it is not available for plant uptake and will not harm off-site vegetation where roots grow into the treatment area or if the soil is transported off-site. The strong affinity of this product to soil particles prevents this product from leaching out of the soil profile and entering ground water. The affinity between this product and soil particles remains until this product is degraded, which is primarily a biological degradation process carried out under both aerobic and anaerobic conditions by soil microflora.

**Time to Symptoms:** This product moves through the plant from the point of foliage contact to and into the root system. Visible effects on most annual weeds occur within 2 to 4 days, but on most perennial weeds may not occur for 7 days or more. Extremely cool or cloudy weather following treatment may slow activity of this product and delay development of visual symptoms. Visible effects are a gradual wilting and yellowing of the plant which advances to complete browning of aboveground growth and deterioration of underground plant parts.

**Mode of Action in Plants:** The active ingredient in this product inhibits an enzyme found only in plants that is essential to formation of specific amino acids.

**Cultural Considerations:** Reduced control may result when applications are made to annual or perennial weeds that have been mowed, grazed or cut, and have not been allowed to regrow to the recommended stage for treatment.

**Rainfastness:** Heavy rainfall soon after application may wash this product off of the foliage and a repeat application may be required for adequate control.

**No Soil Activity:** Weeds must be emerged at the time of application to be controlled by this product. Weeds germinating from seed after application will not be controlled. Unemerged plants arising from unattached underground rhizomes or root stocks of perennials will not be affected by the herbicide.

**Volatility:** Roundup Pro Concentrate herbicide is nonvolatile. Therefore, it cannot move as a vapor after application to affect nearby vegetation.

**Toxicology:** Exposure to workers and other applicators generally is expected to pose minimal risks based on results of short-term toxicity studies. Glyphosate has been thoroughly tested and determined not to cause cancer or other adverse long-term health effects.

**Tank Mixing:** This product does not provide residual weed control. For subsequent residual weed control, follow a label-approved herbicide program. Read and carefully observe the cautionary statements and all other information appearing on the labels of all herbicides used. Use according to the most restrictive label directions for each product in the mixture.

Buyer and all users are responsible for all loss or damage in connection with the use or handling of mixtures of this product with herbicides or other materials that are not expressly recommended in this label. Mixing this product with herbicides or other materials not recommended on this label may result in reduced performance.

**Grazing Restrictions for Utility Rights-of-Way:** This product may be used to treat undesirable vegetation in rights-of-way that pass through pastures and rangeland and on forestry sites that are being grazed. For tank-mix applications, comply with all restrictions appearing on the tank-mix product label.

There are no grazing restrictions for the following applications of this product:

- Where the spray can be directed onto undesirable

weeds, woody brush and trees, such as in handgun, spray-to-wet or low volume directed spray treatments.

- For tree injection or frill application and for cut stump treatments.

For broadcast applications, observe the following restrictions:

- For application rates of greater than 4 3/4 quarts but not to exceed 8 quarts per acre, no more than 15 percent of the available grazing area may be treated.
- For application rates that do not exceed 4 3/4 quarts per acre, no more than 25 percent of the available grazing area may be treated.
- All restrictions apply to lactating dairy animals. No other restrictions apply to lactating dairy animals.

These recommendations do not apply to rangeland outside of utility rights-of-way.

**Annual Maximum Use Rate:** The combined total of all treatments must not exceed 8.5 quarts of this product per acre per year.

**ATTENTION**

AVOID CONTACT OF HERBICIDE WITH FOLIAGE, GREEN STEMS, EXPOSED NON-WOODY ROOTS OR FRUIT OF CROPS, DESIRABLE PLANTS AND TREES, BECAUSE SEVERE INJURY OR DESTRUCTION MAY RESULT.

AVOID DRIFT. EXTREME CARE MUST BE USED WHEN APPLYING THIS PRODUCT TO PREVENT INJURY TO DESIRABLE PLANTS AND CROPS.

Do not allow the herbicide solution to mist, drip, drift or splash onto desirable vegetation since minute quantities of this product can cause severe damage or destruction to the crop, plants or other areas on which treatment was not intended. The likelihood of injury occurring from the use of this product increases when winds are gusty, as wind velocity increases, when wind direction is constantly changing or when there are other meteorological conditions that favor spray drift. When spraying, avoid combinations of pressure and nozzle type that will result in splatter or fine particles (mist) which are likely to drift. AVOID APPLYING AT EXCESSIVE SPEED OR PRESSURE.

**NOTE:** Use of this product in any manner not consistent with this label may result in injury to persons, animals or crops, or other unintended consequences. Keep container closed to prevent spills and contamination.

# 6.0 MIXING

Clean sprayer parts immediately after using this product by thoroughly flushing with water.

**NOTE:** REDUCED RESULTS MAY OCCUR IF WATER CONTAINING SOIL IS USED, SUCH AS VISIBLY MUDDY WATER OR WATER FROM PONDS AND DITCHES THAT IS NOT CLEAR.

Now More Concentrated

Use the following conversion table to help determine application rates of Roundup Pro Concentrate herbicide based on commonly used rates of Roundup Pro® herbicide:

| Roundup Pro Concentrate (Ounces) | Roundup Pro (Ounces) | Roundup Pro (Pints) |
|---|---|---|
| 20 | 24 | 1.5 |
| 26 | 32 | 2.0 |
| 32 | 40 | 2.5 |

## 6.1 Mixing With Water

This product mixes readily with water. Mix spray solutions of this product as follows: Fill the mixing or spray tank with the required amount of water. Add the recommended amount of this product near the end of the filling process and mix well. Use caution to avoid siphoning back into the carrier source. Use approved anti-backsiphoning devices where required by state or local regulations. During mixing and application, foaming of the spray solution may occur. To prevent or minimize foam, avoid the use of mechanical agitators, terminate by-pass and return lines at the bottom of the tank and, if needed, use an approved anti-foam or defoaming agent.

## 6.2 Tank Mixing Procedure

When tank mixing, read and carefully observe label directions, cautionary statements and all information on the labels of all products used. Add the tank-mix product to the tank as directed by the label. Maintain agitation and add the recommended amount of this product.

Maintain good agitation at all times until the contents of the tank are sprayed. If the spray mixture is allowed to settle, thorough agitation may be required to resuspend the mixture before spraying is resumed.

Keep by-pass line on or near the bottom of the tank to minimize foaming. Screen size in nozzle or line strainers should be no finer than 50 mesh.

Always predetermine the compatibility of labeled tank mixtures of this product with water carrier by mixing small proportional quantities in advance.

Refer to the **"Tank Mixing"** section of "GENERAL INFORMATION" for additional precautions.

## 6.3 Mixing for Hand-Held Sprayers

Prepare the desired volume of spray solution by mixing the amount of this product in water as shown in the following table:

**Spray Solution**

| Desired Volume | Amount of Roundup Pro Concentrate herbicide | | | | | |
|---|---|---|---|---|---|---|
| | 0.4% | 0.8% | 1.2% | 1.6% | 4% | 8% |
| 1 Gallon | 0.5 oz | 1 oz | 1.6 oz | 2.1 oz | 5.2 oz | 10.5 oz |
| 25 Gallon | 13 oz | 0.8 qt | 1.2 qt | 1.6 qt | 4 qt | 8 qt |
| 100 Gallon | 1.6 qt | 0.8 gal | 1.2 gal | 1.6 gal | 4 gal | 8 gal |

2 tablespoons = 1 fluid ounce

For use in backpack, knapsack or pump-up sprayers, it is suggested that the recommended amount of this product be mixed with water in a larger container. Fill sprayer with the mixed solution.

## 6.4 Colorants or Dyes

Agriculturally approved colorants or marking dyes may be added to this product. Colorants or dyes used in spray solutions of this product may reduce performance, especially at lower rates or dilution. Use colorants or dyes according to the manufacturer's recommendations.

# 7.0 APPLICATION EQUIPMENT AND TECHNIQUES

**SPRAY DRIFT MANAGEMENT**

AVOID DRIFT. EXTREME CARE MUST BE USED WHEN APPLYING THIS PRODUCT TO PREVENT INJURY TO DESIRABLE PLANTS AND CROPS.

Avoiding spray drift at the application site is the responsibility of the applicator. The interaction of many equipment- and weather-related factors determine the potential for spray drift. The applicator and the grower are responsible for considering all these factors when making decisions.

Do not apply this product through any type of irrigation system.

Apply these spray solutions in properly maintained and calibrated equipment capable of delivering desired volumes.

Do not allow the herbicide solution to mist, drip, drift or splash onto desirable vegetation since minute quantities of this product can cause severe damage or destruction to the crop, plants or other areas on which treatment was not intended.

## 7.1 Aerial Equipment

DO NOT APPLY THIS PRODUCT USING AERIAL SPRAY EQUIPMENT EXCEPT UNDER CONDITIONS AS SPECIFIED WITHIN THIS LABEL.

For aerial broadcast applications, unless otherwise specified, use this product at the rate of 0.8 to 1.6 quarts per acre for annual weeds, 1.6 to 4 quarts per acre for perennial weeds and 4 to 8 quarts per acre for woody brush and trees. Use the recommended rates of this herbicide in 3 to 25 gallons of water per acre. When used according

to label directions this product will give control or partial control of herbaceous weeds, woody brush and trees listed in the "WEEDS CONTROLLED" section of this label.

FOR AERIAL APPLICATION IN CALIFORNIA, REFER TO THE FEDERAL SUPPLEMENTAL LABEL FOR AERIAL APPLICATIONS IN THAT STATE FOR SPECIFIC INSTRUCTIONS, RESTRICTIONS AND REQUIREMENTS. This product plus Banvel™ tank mixtures may not be applied by air in California.

**AERIAL SPRAY DRIFT MANAGEMENT**

The following drift management requirements must be followed to avoid off-target drift movement from aerial applications to agricultural field crops. These requirements do not apply to forestry applications or to public health uses.

1. The distance of the outermost nozzles on the boom must not exceed 3/4 the length of the wingspan or rotor.
2. Nozzles must always point backward parallel with the airstream and never be pointed downwards more than 45 degrees. Where states have more stringent regulations, they should be observed.

**Importance of droplet size**

The most effective way to reduce drift potential is to apply large droplets. The best drift management strategy is to apply the largest droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential, but will not prevent drift if applications are made improperly, or under unfavorable environmental conditions (see the **"Wind"**, **"Temperature and Humidity"**, and **"Temperature Inversion"** sections of this label).

**Controlling droplet size**

- **Volume:** Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with the higher rated flows produce larger droplets.
- **Pressure:** Use the lower spray pressures recommended for the nozzle. Higher pressure reduces droplet size and does not improve canopy penetration. When higher flow rates are needed, use higher flow rate nozzles instead of increasing pressure.
- **Number of nozzles:** Use the minimum number of nozzles that provide uniform coverage.
- **Nozzle orientation:** Orienting nozzles so that the spray is released backwards, parallel to the airstream, will produce larger droplets than other orientations. Significant deflection from the horizontal will reduce droplet size and increase drift potential.
- **Nozzle type:** Use a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles. Solid stream nozzles oriented straight back produce larger droplets than other nozzle types.
- **Boom length:** For some use patterns, reducing the effective boom length to less than 3/4 of the wingspan or rotor length may further reduce drift without reducing swath width.
- **Application height:** Applications should not be made at a height greater than 10 feet above the top of the largest plants unless a greater height is required for aircraft safety. Making applications at the lowest height that is safe reduces the exposure of the droplets to evaporation and wind.

**Swath Adjustment**

When applications are made with a crosswind, the swath will be displaced downward. Therefore, on the up and downwind edges of the field, the applicator must compensate for this displacement by adjusting the path of the aircraft upwind. Swath adjustment distance should increase, with increasing drift potential (higher wind, smaller droplets, etc.).

**Wind**

Drift potential is lowest between wind speeds of 2 to 10 mph. However, many factors, including droplet size and equipment type determine drift potential at any given speed. Application should be avoided below 2 mph due to variable wind direction and high inversion potential. **NOTE:** Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect drift.

**Temperature and Humidity**

When making applications in low relative humidity, set up equipment to produce larger droplets to compensate for evaporation. Droplet evaporation is most severe when conditions are both hot and dry.

**Temperature Inversions**

Applications should not occur during a temperature inversion because drift potential is high. Temperature inversions restrict vertical air mixing, which causes small, suspended droplets to remain in a concentrated cloud. This cloud can move in unpredictable directions due to the light variable winds common during inversions. Temperature inversions are characterized by increasing temperatures with altitude and are common on nights with limited cloud cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of smoke from a ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a concentrated cloud (under low wind conditions) indicates an inversion, while smoke that moves upward and rapidly dissipates indicates good vertical air mixing.

**Sensitive Areas**

The pesticide should only be applied when the potential for drift to adjacent sensitive areas (e.g., residential areas, bodies of water, known habitat for threatened or endangered species, non-target crops) is minimal (e.g., when wind is blowing away from the sensitive areas).

Avoid direct application to any body of water.

Drift control additives may be used. When a drift control additive is used, read and carefully observe the cautionary statements and all other information appearing on the additive label.

Ensure uniform application—To avoid streaked, uneven or overlapped application, use appropriate marking devices.

PROLONGED EXPOSURE OF THIS PRODUCT TO UNCOATED STEEL SURFACES MAY RESULT IN CORROSION AND POSSIBLE FAILURE OF THE PART. The maintenance of an organic coating (paint) which meets aerospace specification MIL-C-38413 may prevent corrosion. To prevent corrosion of exposed parts, thoroughly wash aircraft after each day of spraying to remove residues of this product accumulated during spraying or from spills. Landing gear are most susceptible.

## 7.2 Ground Broadcast Equipment

For broadcast ground applications, unless otherwise specified use this product at the rate of 0.8 to 1.6 quarts per acre for annual weeds, 1.6 to 4 quarts per acre for perennial weeds and 4 to 8 quarts per acre for woody brush and trees. When used according to label directions this product will give control or partial control of herbaceous weeds, woody brush and trees listed in the "WEEDS CONTROLLED" section of this label.

Use the recommended rates of this product in 3 to 40 gallons of water per acre as a broadcast spray unless otherwise specified. As density of weeds increases, spray volume should be increased within the recommended range to ensure complete coverage. Carefully select proper nozzles to avoid spraying a fine mist. For best results with ground application equipment, use flat-fan nozzles. Check for even distribution of spray droplets.

## 7.3 Hand-Held and High-Volume Equipment

Apply to foliage of vegetation to be controlled. For applications made on a spray-to-wet basis, spray coverage should be uniform and complete. Do not spray to the point of runoff. Use coarse sprays only.

For control of weeds listed in the **"Annual Weeds"** section of "WEEDS CONTROLLED", apply a 0.4 percent solution of this product to weeds less than 6 inches in height or runner length. For annual weeds over 6 inches tall, or unless otherwise specified, use a 0.8 percent solution. Apply prior to seedhead formation in grass or bud formation in broadleaf weeds.

For best results, use a 1.6 percent solution on harder-to-control perennials, such as bermudagrass, dock, field bindweed, hemp dogbane, milkweed and Canada thistle.

For low volume directed spray applications, use a 4 to 8 percent solution of this product for control or partial control of annual weeds, perennial weeds, or woody brush and trees. Spray coverage should be uniform with at least 50 percent of the foliage contacted. Coverage of the top one-half of the plant is important for best results. To ensure adequate spray coverage, spray both sides of large or tall woody brush and trees, when foliage is thick and dense, or where there are multiple sprouts.

## 7.4 Selective Equipment

This product may be applied through recirculating spray systems, shielded applicators, hooded sprayers, wiper applicators or sponge bars after dilution and thorough mixing with water to listed weeds growing in any noncrop site specified on this label.

A recirculating spray system directs the spray solution onto weeds growing above desirable vegetation, while spray solution not intercepted by weeds is collected and returned to the spray tank for reuse.

A shielded or hooded applicator directs the herbicide solution onto weeds, while shielding desirable vegetation from the herbicide.

A wiper or sponge applicator applies the herbicide solution onto weeds by rubbing the weed with an absorbent material containing the herbicide solution.

AVOID CONTACT OF HERBICIDE WITH DESIRABLE VEGETATION.

Applicators used above desired vegetation should be adjusted so that the lowest spray stream or wiper contact point is at least 2 inches above the desirable vegetation. Droplets, mist, foam or splatter of the herbicide solution settling on desirable vegetation is likely to result in discoloration, stunting or destruction.

Better results may be obtained when more of the weed is exposed to the herbicide solution. Weeds not contacted by the herbicide solution will not be affected. This may occur in dense clumps, severe infestations or when the height of the weeds varies so that not all weeds are contacted. In these instances, repeat treatment may be necessary.

**Shielded and Hooded Applicators**

Use nozzles that provide uniform coverage within the treated area. Keep shields on these sprayers adjusted to protect desirable vegetation. EXTREME CARE MUST BE EXERCISED TO AVOID CONTACT OF HERBICIDE WITH DESIRABLE VEGETATION.

**Wiper Applicators and Sponge Bars**

Equipment must be designed, maintained and operated to prevent the herbicide solution from contacting desirable vegetation. Operate this equipment at ground speeds no greater than 5 mph. Performance may be improved by reducing speed in areas of heavy weed infestations to ensure adequate wiper saturation. Better results may be obtained if 2 applications are made in opposite directions.

Avoid leakage or dripping onto desirable vegetation. Adjust height of applicator to ensure adequate contact with weeds. Keep wiping surfaces clean. Be aware that, on sloping ground, the herbicide solution may migrate, causing dripping on the lower end and drying of the wicks on the upper end of a wiper applicator.

Do not use wiper equipment when weeds are wet.

Mix only the amount of solution to be used during a 1-day period, as reduced activity may result from use of leftover solutions. Clean wiper parts immediately after using this product by thoroughly flushing with water.

**For Rope or Sponge Wick Applicators**—Solutions ranging from 33 to 75 percent of this product in water may be used.

**For Porous-Plastic Applicators and Pressure-Feed Systems**—Solutions ranging from 33 to 100 percent of this product in water may be used.

When applied as recommended, this product CONTROLS the following weeds:

Corn, volunteer
Panicum, Texas
Rye, common
Shattercane
Sicklepod
Spanishneedles
Starbur, bristly

When applied as recommended, this product SUPPRESSES the following weeds:

Beggarweed, Florida
Bermudagrass
Dogbane, hemp
Dogfennel
Guineagrass
Johnsongrass
Milkweed
Nightshade, silverleaf
Pigweed, redroot
Ragweed, common
Ragweed, giant
Smutgrass
Sunflower
Thistle, Canada
Thistle, musk
Vaseygrass
Velvetleaf

## 7.5 Injection Systems

This product may be used in aerial or ground injection spray systems. It may be used as a liquid concentrate or diluted prior to injecting into the spray stream. Do not mix this product with the undiluted concentrate of other products when using injection systems unless specifically recommended.

## 7.6 CDA Equipment

The rate of this product applied per acre by controlled droplet application (CDA) equipment must not be less than the amount recommended in this label when applied by conventional broadcast equipment. For vehicle-mounted CDA equipment, apply 3 to 15 gallons of water per acre.

CDA equipment produces a spray pattern which is not easily visible. Extreme care must be exercised to avoid spray or drift contacting the foliage or any other green tissue of desirable vegetation, as damage or destruction is likely to result.

# 8.0 SITE AND USE RECOMMENDATIONS

Detailed instructions follow alphabetically, by site.

Unless otherwise specified, applications may be made to control any weeds listed in the annual, perennial and woody brush tables. Refer also to the **"Selective Equipment"** section.

## 8.1 Cut Stumps

Cut stump treatments may be made on any site listed on this label. This product will control many types of woody brush and tree species, some of which are listed below. Apply this product using suitable equipment to ensure coverage of the entire cambium. Cut trees or resprouts close to the soil surface. Apply a 50 to 100 percent solution of this product to the freshly-cut surface **immediately** after cutting. Delays in application may result in reduced performance. For best results, applications should be made during periods of active growth and full leaf expansion.

Alder
Eucalyptus
Madrone
Oak
Reed, giant
Saltcedar
Sweetgum
Tan oak
Willow

DO NOT MAKE CUT STUMP APPLICATIONS WHEN THE ROOTS OF DESIRABLE WOODY BRUSH OR TREES MAY BE GRAFTED TO THE ROOTS OF THE CUT STUMP. INJURY RESULTING FROM ROOT GRAFTING IS LIKELY TO OCCUR IN ADJACENT WOODY BRUSH OR TREES.

## 8.2 General Noncrop Areas and Industrial Sites

Use in areas such as airports, ditch banks, dry ditches, dry canals, fencerows, industrial sites, lumber yards, ornamental nurseries, parking areas, petroleum tank farms and pumping installations, railroads, roadsides, sod and turf farms, storage areas, warehouse areas, and similar industrial and noncrop sites.

**General Weed Control, Trim-and-Edge and Bare Ground**

This product may be used in general noncrop areas. It

may be applied with any application equipment described in this label. This product may be used to trim-and-edge around objects in noncrop sites. This product may be used prior to laying asphalt or beginning construction projects.

Repeated applications of this product may be used, as weeds emerge, to maintain bare ground.

This product may be tank mixed with the following products. Refer to these products' labels for approved noncrop sites and application rates.

| | |
|---|---|
| ARSENAL™ | DIURON |
| BANVEL | ENDURANCE™ |
| BARRICADE™ 65WG | ESCORT™ |
| GARLON™ 3A | PRINCEP™ DF |
| GARLON 4 | PRINCEP LIQUID |
| KARMEX™ DF | RONSTAR™ 50WP |
| KROVAR™ I DF | SAHARA™ |
| MANAGE® | SIMAZINE |
| OUST™ | SURFLAN™ |
| PENDULUM™ 3.3 EC | TELAR™ |
| PENDULUM WDG | VANQUISH™ |
| PLATEAU™ | 2,4-D |

Banvel tank mixtures may not be applied by air in California.

When applied as a tank mixture for bare ground, this product provides control of the emerged annual weeds and control or partial control of emerged perennial weeds, woody brush and trees.

For control or partial control of the following perennial weeds, apply 0.8 to 1.6 quarts of this product plus 2 to 4 ounces of Oust per acre.

| | |
|---|---|
| Bahiagrass | Fescue, tall |
| Bermudagrass | Johnsongrass |
| Broomsedge | Poorjoe |
| Dallisgrass | Quackgrass |
| Dock, curly | Vaseygrass |
| Dogfennel | Vervain, blue |

**Chemical Mowing—Perennials**

This product will suppress perennial grasses listed in this section to serve as a substitute for mowing. Use 6.4 fluid ounces of this product per acre when treating tall fescue, fine fescue, orchardgrass or quackgrass covers. Use 5 fluid ounces of this product per acre when treating Kentucky bluegrass. Apply treatments in 10 to 40 gallons of spray solution per acre.

Use only in areas where some temporary injury or discoloration of perennial grasses can be tolerated.

**Chemical Mowing—Annuals**

For growth suppression of some annual grasses, such as annual ryegrass, wild barley and wild oats growing in coarse turf on roadsides or other industrial areas, apply 3 to 4 fluid ounces of this product in 10 to 40 gallons of spray solution per acre. Applications should be made when annual grasses are actively growing and before the seedheads are in the boot stage of development. Treatments may cause injury to the desired grasses.

## 8.3 Habitat Management

**Habitat Restoration and Management**

This product may be used to control exotic and other undesirable vegetation in habitat management and natural areas, including rangeland and wildlife refuges. Applications can be made to allow recovery of native plant species, prior to planting desirable native species, and for similar broad spectrum vegetation control requirements. Spot treatments can be made to selectively remove unwanted plants for habitat management and enhancement.

**Wildlife Food Plots**

This product may be used as a site preparation treatment prior to planting wildlife food plots. Any wildlife food species may be planted after applying this product, or native species may be allowed to repopulate the area. If tillage is needed to prepare a seedbed, wait 7 days after application before tillage to allow translocation into underground plant parts.

## 8.4 Injection and Frill (Woody Brush and Trees)

This product may be used to control woody brush and trees by injection or frill applications. Apply this product using suitable equipment which must penetrate into the living tissue. Apply the equivalent of 1 milliter of this product per each 2 to 3 inches of trunk diameter at breast height (DBH). This is best achieved by applying a 50 to 100 percent concentration of this product either to a continuous frill around the tree or as cuts evenly spaced around the tree below all branches. As tree diameter increases in size, better results are achieved by applying diluted material to a continuous frill or more closely spaced cuttings. Avoid application techniques that allow runoff to occur from frilled or cut areas in species that exude sap freely. In species such as this, make the frill or cuts at an oblique angle to produce a cupping effect and use a 100 percent concentration of this product. For best results, application should be made during periods of active growth and after full leaf expansion. This product will control many species, some of which are listed below:

| Control | Partial Control |
|---|---|
| Oak | Black gum |
| Poplar | Dogwood |
| Sweetgum | Hickory |
| Sycamore | Maple, red |

## 8.5 Ornamental and Plant Nurseries, Christmas Trees

**Post-Directed, Trim-and-Edge**

This product may be used as a post-directed spray around established woody ornamental species such as arborvitae, azalea, boxwood, crabapple, euonymus, fir, douglas fir, jojoba, hollies, lilac, magnolia, maple, oak, privet, pine, spruce and yew. This product may also be used to trim-and-edge around trees, buildings, sidewalks and roads, potted plants and other objects in a nursery setting.

Desirable plants may be protected from the spray solution by using shields or coverings made of cardboard or other impermeable material. THIS PRODUCT IS NOT RECOMMENDED FOR USE AS AN OVER-THE-TOP BROADCAST SPRAY IN ORNAMENTALS AND CHRISTMAS TREES. Care must be exercised to avoid contact of spray, drift or mist with foliage or green bark of established ornamental species.

**Site Preparation**

This product may be used prior to planting any ornamental, nursery or Christmas tree species.

**Greenhouse/Shadehouse**

This product may be used to control weeds growing in and around greenhouses and shadehouses. Desirable vegetation must not be present during application and air circulation fans must be turned off.

## 8.6 Railroads

All of the instructions in the **"General Noncrop Areas and Industrial Sites"** section apply to railroads.

**Bare Ground, Ballast and Shoulders, Crossings, and Spot treatment**

This product may be used to maintain bare ground on railroad ballast and shoulders. Repeat applications of this product may be used, as weeds emerge, to maintain bare ground. This product may be used to control tall-growing weeds to improve line-of-sight at railroad crossings and reduce the need for mowing along rights-of-way. For crossing applications, up to 80 gallons of spray solution per acre may be used. This product may be tank-mixed with the following products for ballast, shoulder, spot, bare ground and crossing treatments:

| | |
|---|---|
| ARSENAL | KROVAR I DF |
| BANVEL | OUST |
| DIURON | SAHARA |
| ESCORT | SPIKE™ |
| GARLON 3A | TELAR |
| GARLON 4 | VANQUISH |
| HYVAR™ X | 2,4-D |

**Brush Control**

This product may be used to control woody brush and trees on railroad rights-of-way. Apply 3 to 8 quarts of this product per acre as a broadcast spray, using boom-type or boomless nozzles. Up to 80 gallons of spray solution per acre may be used. Apply a 2/3 to 1.6 percent solution of this product when using high-volume spray-to-wet applications. Apply a 4 to 8 percent solution of this product when using low volume directed sprays for spot treatment. This product may be mixed with the following products for enhanced control of woody brush and trees:

| | |
|---|---|
| ARSENAL | GARLON 4 |
| ESCOR | TORDON™ K |
| GARLON 3A | |

**Bermudagrass Release**

This product may be used to control or partially control many annual and perennial weeds for effective release of actively growing bermudagrass. Apply 13 to 38 fluid ounces of this product in up to 80 gallons of spray solution per acre. Use the lower rate when treating annual weeds below 6 inches in height (or runner length). Use the higher rate as weeds increase in size or as they approach flower or seedhead formation. These rates will also provide partial control of the following perennial species:

| | |
|---|---|
| Bahiagrass | Johnsongrass |
| Bluestem, silver | Trumpetcreeper |
| Fescue, tall | Vaseygrass |

This product may be tank-mixed with Oust. If tank-mixed, use no more than 13 to 38 fluid ounces of this product with 1 to 2 ounces of Oust per acre. Use the lower rates of each product to control annual weeds less than 6 inches in height (or runner length) that are listed in this label and the Oust label. Use the higher rates as annual weeds increase in size and approach the flower or seedhead stages. These rates will also provide partial control of the following perennial weeds:

| | |
|---|---|
| Bahiagrass | Fescue, tall |
| Blackberry | Johnsongrass |
| Bluestem, silver | Poorjoe |
| Broomsedge | Raspberry |
| Dallisgrass | Trumpetcreeper |
| Dewberry | Vaseygrass |
| Dock, curly | Vervain, blue |
| Dogfennel | |

Use only on well-established bermudagrass. Bermudagrass injury may result from the treatment, but regrowth will occur under moist conditions. Repeat applications in the same season are not recommended, since severe injury may occur.

## 8.7 Roadsides

All of the instructions in the **"General Noncrop Areas and Industrial Sites"** section apply to roadsides.

**Shoulder Treatments**

This product may be used on road shoulders. It may be applied with boom sprayers, shielded boom sprayers, high-volume off-center nozzles, hand-held equipment, and similar equipment.

**Guardrails and Other Obstacles to Mowing**

This product may be used to control weeds growing under guardrails and around signposts and other objects along the roadside.

**Spot Treatment**

This product may be used as a spot treatment to control unwanted vegetation growing along roadsides.

**Tank Mixtures**

This product may be tank-mixed with the following products for shoulder, guardrail, spot and bare ground treatments:

| | |
|---|---|
| BANVEL | PRINCEP DF |
| DIURON | PRINCEP LIQUID |
| ENDURANCE | RONSTAR 50WP |
| ESCORT | SAHARA |
| KROVAR I DF | SIMAZINE |
| OUTRIDER® | SURFLAN |
| OUST | TELAR |
| PENDULUM 3.3 EC | VANQUISH |
| PENDULUM WDG | 2,4-D |

See the **"General Noncrop Areas and Industrial Sites"** section of this label for general instructions for tank mixing.

**Release of Bermudagrass or Bahiagrass**

**Dormant Applications**

This product may be used to control or partially control many winter annual weeds and tall fescue for effective release of dormant bermudagrass or bahiagrass. Treat only when turf is dormant and prior to spring greenup. This product may also be tank-mixed with Outrider herbicide or Oust for residual control. Tank mixtures of this product with Oust may delay greenup.

For best results on winter annuals, treat when plants are in an early growth stage (below 6 inches in height) after most have germinated. For best results on tall fescue, treat when fescue is at or beyond the 4- to 6-leaf stage.

Apply 6.4 to 51 fluid ounces of this product in a tank mixture with 3/4 to 1 1/3 ounces Outrider herbicide per acre. Read and follow all label directions for Outrider herbicide.

Apply 6.4 to 51 fluid ounces of this product per acre alone or in a tank mixture with 1/4 to 1 ounce per acre of Oust. Apply the recommended rates in 10 to 40 gallons of water per acre. Use only in areas where bermudagrass or bahiagrass are desirable ground covers and where some temporary injury or discoloration can be tolerated. To avoid delays in greenup and minimize injury, add no more than 1 ounce of Oust per acre on bermudagrass and no more than 0.5 ounce of Oust per acre on bahiagrass and avoid treatments when these grasses are in a semi-dormant condition.

**Actively Growing Bermudagrass**

This product may be used to control or partially control many annual and perennial weeds for effective release of actively growing bermudagrass. Apply 13 to 38 fluid ounces of this product in 10 to 40 gallons of spray solution per acre. Use the lower rate when treating annual weeds below 6 inches in height (or runner length). Use the higher rate as weeds increase in size or as they approach flower or seedhead formation. These rates will also provide partial control of the following perennial species:

| | |
|---|---|
| Bahiagrass | Johnsongrass |
| Bluestem, silver | Trumpetcreeper |
| Fescue, tall | Vaseygrass |

This product may be tank mixed with Outrider herbicide for control or partial control of Johnsongrass and other weeds listed in the Outrider herbicide label. Use 6.4 to 26 fluid ounces of this product with 3/4 to 1 1/3 ounces of Outrider herbicide. Use the higher rates of both products for control of perennial weeds or annual weeds greater than 6 inches in height.

This product may be tank-mixed with Oust. If tank-mixed, use no more than 13 to 26 fluid ounces of this product with 1 to 2 ounces of Oust per acre. Use the lower rates of each product to control annual weeds less than 6 inches in height (or runner length) that are listed in this label and the Oust label. Use the higher rates as annual weeds increase in size and approach the flower or seedhead stages. These rates will also provide partial control of the following perennial weeds:

| | |
|---|---|
| Bahiagrass | Fescue, tall |
| Bluestem, silver | Johnsongrass |
| Broomsedge | Poorjoe |
| Dallisgrass | Trumpetcreeper |
| Dock, curly | Vaseygrass |
| Dogfennel | Vervain, blue |

Use only on well-established bermudagrass. Bermudagrass injury may result from the treatment, but regrowth will occur under moist conditions. Repeat applications of the tank-mix in the same season are not recommended, since severe injury may occur.

**Actively Growing Bahiagrass**

For suppression of vegetative growth and seedhead inhibition of bahiagrass for approximately 45 days, apply 5 fluid ounces of this product in 10 to 40 gallons of water per acre. Apply 1 to 2 weeks after full greenup or after mowing to a uniform height of 3 to 4 inches. This application must be made prior to seedhead emergence.

For suppression up to 120 days, apply 3 fluid ounces of this product per acre, followed by an application of 1.5 to 3 fluid ounces per acre about 45 days later. Make no more than 2 applications per year.

This product may be used for control or partial control of Johnsongrass and other weeds listed on the Outrider herbicide label in actively growing bahiagrass. Apply 1 1/4 to 4 ounces of this product with 3/4 to 1 1/3 ounces of Outrider herbicide per acre. Use the higher rates for control of perennial weeds or annual weeds greater than 6 inches in height. Use only on well-established bahiagrass.

A tank mixture of this product plus Oust may be used. Apply 5 fluid ounces of this product plus 0.25 ounce of Oust per acre 1 to 2 weeks following an initial spring mowing. Make only one application per year.

# 9.0 WEEDS CONTROLLED

Always use the higher rate of this product per acre within the recommended range when weed growth is heavy or dense or weeds are growing in an undisturbed (nonculti-vated) area.

Reduced results may occur when treating weeds heavily covered with dust. For weeds that have been mowed, grazed or cut, allow regrowth to occur prior to treatment.

Refer to the following label sections for recommended rates for the control of annual and perennial weeds and woody brush and trees. For difficult to control perennial weeds and woody brush and trees, where plants are growing under stressed conditions, or where infestations are dense, this product may be used at 4 to 8 quarts per acre for enhanced results.

## 9.1 Annual Weeds

Use 26 fluid ounces per acre if weeds are less than 6 inches in height or runner length and 1.2 to 3.2 quarts per acre if weeds are over 6 inches in height or runner length or when weeds are growing under stressed conditions.

For spray-to-wet applications, apply a 0.4 percent solution of this product to weeds less than 6 inches in height or runner length. Apply prior to seedhead formation in grass or bud formation in broadleaf weeds. For annual weeds over 6 inches tall, or for smaller weeds growing under stressed conditions, use a 0.8 to 1.6 percent solution. Use the higher rate for tough-to-control species or for weeds over 24 inches tall.

**WEED SPECIES**

Annoda, spurred
Barley*
Barnyardgrass*
Bittercress*
Black nightshade*
Bluegrass, annual*
Bluegrass, bulbous*
Bassia, fivehook
Brome, downy*
Brome, Japanese*
Browntop panicum*
Buttercup*
Carolina foxtail*
Carolina geranium
Castor bean
Cheatgrass*
Cheeseweed
*(Malva parviflora)*
Chervil*
Chickweed*
Cocklebur*
Copperleaf, hophornbeam
Corn*
Corn speedwell*
Crabgrass*
Dwarfdandelion*
Eastern mannagrass*
Eclipta*
Fall panicum*
Falsedandelion*
Falseflax, smallseed*
Fiddleneck
Field pennycress*
Filaree
Fleabane, annual*
Fleabane, hairy
*(Conyza bonariensis)**
Fleabane, rough*
Florida pusley
Foxtail*
Goatgrass, jointed*
Goosegrass
Grain sorghum (milo)*
Groundsel, common*
Hemp sesbania
Henbit
Horseweed/Marestail
*(Conyza canadensis)*
Itchgrass*
Johnsongrass, seedling
Junglerice
Knotweed
Kochia
Lambsquarters*
Little barley*
London rocket*
Mayweed
Medusahead*
Morningglory
*(Ipomoea spp.)*
Mustard, blue*
Mustard, tansy*
Mustard, tumble*
Mustard, wild*
Oats
Pigweed*
Plains/Tickseed
coreopsis*
Prickly lettuce*
Puncturevine
Purslane, common
Ragweed, common*
Ragweed, giant
Red rice
Russian thistle
Rye*
Ryegrass*
Sandbur, field*
Shattercane*
Shepherd's-purse*
Sicklepod
Signalgrass, broadleaf*
Smartweed, ladysthumb*
Smartweed,
Pennsylvania*
Sowthistle, annual
Spanishneedles
Speedwell, purslane*
Sprangletop*
Spurge, annual
Spurge, prostrate*
Spurge, spotted*
Spurry, umbrella*
Starthistle, yellow
Stinkgrass*
Sunflower*
Teaweed/Prickly sida
Texas panicum*
Velvetleaf
Virginia copperleaf
Virginia pepperweed*
Wheat*
Wild oats*
Witchgrass*
Woolly cupgrass*
Yellow rocket

*When using field broadcast equipment (aerial applications or boom sprayers using flat-fan nozzles) these species will be controlled or partially controlled using 13 fluid ounces of this product per acre. Applications must be made using 3 to 10 gallons of carrier volume per acre. Use nozzles that ensure thorough coverage of foliage and treat when weeds are in an early growth stage.

## 9.2 Perennial Weeds

Best results are obtained when perennial weeds are treated after they reach the reproductive stage of growth (seedhead initiation in grasses and bud formation in broadleaves). For non-flowering plants, best results are obtained when the plants reach a mature stage of growth. In many situations, treatments are required prior to these growth stages. Under these conditions, use the higher application rate within the recommended range.

Ensure thorough coverage when using spray-to-wet treatments using hand-held equipment. When using hand-held equipment for low volume directed spot treatments, apply a 4 to 8 percent solution of this product.

Allow 7 or more days after application before tillage.

| WEED SPECIES | RATE (QT/A) | HAND-HELD % SOLUTION |
|---|---|---|
| Alfalfa* | 0.8 | 1.6 |
| Alligatorweed* | 3.2 | 1.2 |
| Anise (fennel) | 1.6-3.2 | 0.8-1.6 |
| Bahiagrass | 2.4-4 | 1.6 |
| Beachgrass, European *(Ammophila arenaria)* | — | 4 |
| Bentgrass* | 1.2 | 1.6 |
| Bermudagrass | 4 | 1.6 |
| Bermudagrass, water (knotgrass) | 1.2 | 1.6 |
| Bindweed, field | 3.2-4 | 1.6 |
| Bluegrass, Kentucky | 1.6 | 1.6 |
| Blueweed, Texas | 3.2-4 | 1.6 |
| Brackenfern | 2.4-3.2 | 0.8-1.2 |
| Bromegrass, smooth | 1.6 | 1.6 |
| Bursage, woolly-leaf | — | 1.6 |
| Canarygrass, reed | 1.6-2.4 | 1.6 |
| Cattail | 2.4-4 | 1.6 |
| Clover; red, white | 2.4-4 | 1.6 |
| Cogongrass | 2.4-4 | 1.6 |
| Dallisgrass | 2.4-4 | 1.6 |
| Dandelion | 2.4-4 | 1.6 |
| Dock, curly | 2.4-4 | 1.6 |
| Dogbane, hemp | 3.2 | 1.6 |
| Fescue (except tall) | 2.4-4 | 1.6 |
| Fescue, tall | 0.8-2.4 | 1.6 |
| German ivy | 1.6-3.2 | 0.8-1.6 |
| Guineagrass | 2.4 | 0.8 |
| Horsenettle | 2.4-4 | 1.6 |
| Horseradish | 3.2 | 1.6 |
| Iceplant | 1.6 | 1.2-1.6 |
| Jerusalem artichoke | 2.4-4 | 1.6 |
| Johnsongrass | 1.6-2.4 | 0.8 |
| Kikuyugrass | 1.6-2.4 | 1.6 |
| Knapweed | 3.2 | 1.6 |
| Lantana | — | 0.8-1 |
| Lespedeza | 2.4-4 | 1.6 |
| Milkweed, common | 2.4 | 1.6 |
| Muhly, wirestem | 1.6 | 1.6 |
| Mullein, common | 2.4-4 | 1.6 |
| Napiergrass | 2.4-4 | 1.6 |
| Nightshade, silverleaf | 1.6 | 1.6 |
| Nutsedge; purple, yellow | 2.4 | 0.8-1.6 |
| Orchardgrass | 1.6 | 1.6 |
| Pampasgrass | 2.4-4 | 1.2-1.6 |

| WEED SPECIES | RATE (QT/A) | HAND-HELD % SOLUTION |
|---|---|---|
| Paragrass | 2.4-4 | 1.6 |
| Pepperweed, perennial | 3.2 | 1.6 |
| Phragmites* | 2.4-4 | 0.8-1.6 |
| Poison hemlock | 1.6-3.2 | 0.8-1.6 |
| Quackgrass | 1.6-2.4 | 1.6 |
| Redvine* | 1.6 | 1.6 |
| Reed, giant | 3.2-4 | 1.6 |
| Ryegrass, perennial | 1.6-2.4 | 0.8 |
| Smartweed, swamp | 2.4-4 | 1.6 |
| Spurge, leafy* | — | 1.6 |
| Sweet potato, wild* | — | 1.6 |
| Thistle, artichoke | 1.6-2.4 | 0.8-1.6 |
| Thistle, Canada | 1.6-2.4 | 1.6 |
| Timothy | 1.6-2.4 | 1.6 |
| Torpedograss* | 3.2-4 | 1.6 |
| Trumpetcreeper* | 1.6-2.4 | 1.6 |
| Vaseygrass | 2.4-4 | 1.6 |
| Velvetgrass | 2.4-4 | 1.6 |
| Wheatgrass, western | 1.6-2.4 | 1.6 |

*Partial control

## 9.3 Woody Brush and Trees

Apply this product after full leaf expansion, unless otherwise directed. Use the higher rate for larger plants and/or dense areas of growth. On vines, use the higher rate for plants that have reached the woody stage of growth. Best results are obtained when application is made in late summer or fall after fruit formation.

In arid areas, best results are obtained when applications are made in the spring to early summer when brush species are at high moisture content and are flowering.

Ensure thorough coverage when using spray-to-wet treatments using hand-held equipment. When using hand-held equipment for low volume directed-spray spot treatments, apply a 4 to 8 percent solution of this product.

Symptoms may not appear prior to frost or senescence with fall treatments.

Allow 7 or more days after application before tillage, mowing or removal. Repeat treatments may be necessary to control plants regenerating from underground parts or seed. Some autumn colors on undesirable deciduous species are acceptable provided no major leaf drop has occurred. Reduced performance may result if fall treatments are made following a frost.

| WEED SPECIES | BROADCAST RATE (QT/A) | HAND-HELD SPRAY-TO-WET % SOLUTION |
|---|---|---|
| Alder | 2.4-3.2 | 0.8-1.2 |
| Ash* | 1.6-4 | 0.8-1.6 |
| Aspen, quaking | 1.6-2.4 | 0.8-1.2 |
| Bearclover (Bearmat)* | 1.6-4 | 0.8-1.6 |
| Beech* | 1.6-4 | 0.8-1.6 |
| Birch | 1.6 | 0.8 |
| Blackberry | 2.4-3.2 | 0.8-1.2 |
| Blackgum | 1.6-4 | 0.8-1.6 |
| Bracken | 1.6-4 | 0.8-1.6 |
| Broom; French, Scotch | 1.6-4 | 1.2-1.6 |
| Buckwheat, California* | 1.6-3.2 | 0.8-1.6 |
| Cascara* | 1.6-4 | 0.8-1.6 |
| Catsclaw* | — | 0.8-1.2 |
| Ceanothus* | 1.6-4 | 0.8-1.6 |
| Chamise* | 1.6-4 | 0.8 |
| Cherry; bitter, black, pin | 1.6-2.4 | 0.8-1.2 |
| Coyote brush | 2.4-3.2 | 1.2-1.6 |
| Deerweed | 1.6-4 | 0.8 |
| Dogwood* | 1.6-4 | 0.8-1.6 |
| Elderberry | 1.6 | 0.8 |
| Elm* | 1.6-4 | 0.8-1.6 |
| Eucalyptus | — | 1.6 |
| Gorse* | 1.6-4 | 0.8-1.6 |
| Hasardia* | 1.6-3.2 | 0.8-1.6 |
| Hawthorn | 1.6-2.4 | 0.8-1.2 |
| Hazel | 1.6 | 0.8 |
| Hickory* | 1.6-4 | 0.8-1.6 |
| Honeysuckle | 2.4-3.2 | 0.8-1.2 |
| Hornbeam, American* | 1.6-4 | 0.8-1.6 |
| Kudzu | 3.2 | 1.6 |
| Locust, black* | 1.6-3.2 | 0.8-1.6 |
| Madrone resprouts* | — | 1.6 |
| Manzanita* | 1.6-4 | 0.8-1.6 |
| Maple, red | 1.6-3.2 | 0.8-1.2 |
| Maple, sugar | — | 0.8-1.2 |
| Monkey flower* | 1.6-3.2 | 0.8-1.6 |
| Oak; black, white* | 1.6-3.2 | 0.8-1.6 |
| Oak, post | 2.4-3.2 | 0.8-1.2 |
| Oak; northern, pin | 1.6-3.2 | 0.8-1.2 |
| Oak, Scrub* | 1.6-3.2 | 0.8-1.2 |
| Oak; southern red | 1.6-2.4 | 0.8-1.2 |
| Peppertree, Brazilian (Florida holly)* | 1.6-4 | 0.8-1.6 |
| Persimmon* | 1.6-4 | 0.8-1.6 |
| Pine | 1.6-4 | 0.8-1.6 |
| Poison ivy | 3.2-4 | 1.6 |
| Poison oak | 3.2-4 | 1.6 |
| Poplar, yellow* | 1.6-4 | 0.8-1.6 |
| Redbud, eastern | 1.6-4 | 0.8-1.6 |
| Rose, multiflora | 1.6 | 0.8 |
| Russian olive* | 1.6-4 | 0.8-1.6 |
| Sage, black | 1.6-3.2 | 0.8 |
| Sage, white* | 1.6-3.2 | 0.8-1.6 |
| Sage brush, California | 1.6-3.2 | 0.8 |
| Salmonberry | 1.6 | 0.8 |
| Saltcedar* | 1.6-4 | 0.8-1.6 |
| Sassafras* | 1.6-4 | 0.8-1.6 |
| Sourwood* | 1.6-4 | 0.8-1.6 |
| Sumac; laurel, poison, smooth, sugarbush, winged* | 1.6-3.2 | 0.8-1.6 |
| Sweetgum | 1.6-2.4 | 0.8-1.2 |
| Swordfern* | 1.6-4 | 0.8-1.6 |
| Tallowtree, Chinese | — | 0.8 |
| Tan oak resprouts* | — | 1.6 |
| Thimbleberry | 1.6 | 0.8 |
| Tobacco, tree* | 1.6-3.2 | 0.8-1.6 |
| Toyon* | — | 1.6 |
| Trumpetcreeper | 1.6-2.4 | 0.8-1.2 |
| Vine maple* | 1.6-4 | 0.8-1.6 |
| Virginia creeper | 1.6-4 | 0.8-1.6 |
| Waxmyrtle, southern* | 1.6-4 | 0.8-1.6 |
| Willow | 2.4 | 0.8 |
| Yerbasenta* | — | 1.6 |

*Partial control

## 10.0 LIMIT OF WARRANTY AND LIABILITY

Monsanto Company warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes set forth in the Complete Directions for Use label booklet ("Directions") when used in accordance with those Directions under the conditions described therein. NO OTHER EXPRESS WARRANTY OR IMPLIED WARRANTY OF FITNESS FOR PARTICULAR PURPOSE OR MERCHANTABILITY IS MADE. This warranty is also subject to the conditions and limitations stated herein.

Buyer and all users shall promptly notify this Company of any claims whether based in contract, negligence, strict liability, other tort or otherwise.

Buyer and all users are responsible for all loss or damage from use or handling which results from conditions beyond the control of this Company, including, but not limited to, incompatibility with products other than those set forth in the Directions, application to or contact with desirable vegetation, unusual weather, weather conditions which are outside the range considered normal at the application site and for the time period when the product is applied, as well as weather conditions which are outside the application ranges set forth in the Directions, application in any manner not explicitly set forth in the Directions, moisture conditions outside the moisture range specified in the Directions, or the presence of products other than those set forth in the Directions in or on the soil, crop or treated vegetation.

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THE EXCLUSIVE REMEDY OF THE USER OR BUYER, AND THE LIMIT OF THE LIABILITY OF THIS COMPANY OR ANY OTHER SELLER FOR ANY AND ALL LOSSES, INJURIES OR DAMAGES RESULTING FROM THE USE OR HANDLING OF THIS PRODUCT (INCLUDING CLAIMS BASED IN CONTRACT, NEGLIGENCE, STRICT LIABILITY, OTHER TORT OR OTHERWISE) SHALL BE THE PURCHASE PRICE PAID BY THE USER OR BUYER FOR THE QUANTITY OF THIS PRODUCT INVOLVED, OR, AT THE ELECTION OF THIS COMPANY OR ANY OTHER SELLER, THE REPLACEMENT OF SUCH QUANTITY, OR, IF NOT ACQUIRED BY PURCHASE, REPLACEMENT OF SUCH QUANTITY. IN NO EVENT SHALL THIS COMPANY OR ANY OTHER SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES.

Upon opening and using this product, buyer and all users are deemed to have accepted the terms of this LIMIT OF WARRANTY AND LIABILITY which may not be varied by any verbal or written agreement. If terms are not acceptable, return at once unopened.



This product is protected by U.S. Patent Nos. 5,683,958; 5,703,015; 6,063,733; 6,121,199; and 6,121,200. No license granted under any non-U.S. patent(s).

EPA Reg. No. 524-529

In case of an emergency involving this product,
Call Collect, day or night, (314) 694-4000.



MONSANTO

# MONSANTO COMPANY

Material Safety Data Sheet
Commercial Product

## 1. PRODUCT AND COMPANY IDENTIFICATION

**Product name**
**ROUNDUP® Pro Concentrate Herbicide**

**EPA Reg. No.**
524-529
**Chemical name**
Not applicable
**Synonyms**
None
**Company**
MONSANTO COMPANY, 800 N. Lindbergh Blvd., St. Louis, MO, 63167
**Telephone:** 800-332-3111, **Fax:** 314-694-5557
**Emergency numbers**
FOR CHEMICAL EMERGENCY, SPILL LEAK, FIRE, EXPOSURE, OR ACCIDENT Call CHEMTREC - Day or Night: 1-800-424-9300 toll free in the continental U.S., Puerto Rico, Canada, or Virgin Islands. For calls originating elsewhere: 703-527-3887 (collect calls accepted).
FOR MEDICAL EMERGENCY - Day or Night: 314-694-4000 (collect calls accepted).

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

**Active ingredient**
Isopropylamine salt of N-(phosphonomethyl)glycine; {Isopropylamine salt of glyphosate}

**Composition**

| COMPONENT | CAS No. | % by weight (approximate) |
|---|---|---|
| Isopropylamine salt of glyphosate | 38641-94-0 | 50.2 |
| Other ingredients | | 49.8 |

The specific chemical identity is being withheld because it is trade secret information of Monsanto Company.

**OSHA Status**
This product is hazardous according to the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

## 3. HAZARDS IDENTIFICATION

**Emergency overview**
**Appearance and odour (colour/form/odour):** Amber - Brown / Liquid, (viscous) / Slight

CAUTION!
CAUSES MODERATE EYE IRRITATION

**Potential health effects**
**Likely routes of exposure**
Skin contact, eye contact, inhalation
**Eye contact, short term**
Irritating to eyes.
**Skin contact, short term**
Not expected to produce significant adverse effects when recommended use instructions are followed.

**Inhalation, short term**
Not expected to produce significant adverse effects when recommended use instructions are followed.

Refer to section 11 for toxicological and section 12 for environmental information.

## 4. FIRST AID MEASURES

**Eye contact**
Immediately flush with plenty of water.
Continue for at least 15 minutes.
If easy to do, remove contact lenses.
If there are persistent symptoms, obtain medical advice.

**Skin contact**
Immediately wash affected skin with plenty of water.
Take off contaminated clothing, wristwatch, jewellery.
Wash clothes before re-use.

**Inhalation**
Remove to fresh air.

**Ingestion**
Immediately offer water to drink.
Never give anything by mouth to an unconscious person.
Do NOT induce vomiting unless directed by medical personnel.
If symptoms occur, get medical attention.

**Advice to doctors**
This product is not an inhibitor of cholinesterase.

**Antidote**
Treatment with atropine and oximes is not indicated.

## 5. FIRE FIGHTING MEASURES

**Flash point**
None.

**Extinguishing media**
Recommended: Water, foam, dry chemical, carbon dioxide (CO2)

**Unusual fire and explosion hazards**
Minimise use of water to prevent environmental contamination.
Environmental precautions: see section 6.

**Hazardous products of combustion**
Carbon monoxide (CO), nitrogen oxides (NOx), phosphorus oxides (PxOy)

**Fire fighting equipment**
Self-contained breathing apparatus.
Equipment should be thoroughly decontaminated after use.

## 6. ACCIDENTAL RELEASE MEASURES

**Personal precautions**
Use personal protection recommended in section 8.

**Environmental precautions**

SMALL QUANTITIES:
Low environmental hazard.
LARGE QUANTITIES:
Minimise spread.
Contain spillage with sand bags or other means.
Keep out of drains, sewers, ditches and water ways.
Notify authorities.

**Methods for cleaning up**

Absorb in earth, sand or absorbent material.
Dig up heavily contaminated soil.
Collect in containers for disposal.
Refer to section 7 for types of containers.
Flush residues with small quantities of water.
Minimise use of water to prevent environmental contamination.

Refer to section 13 for disposal of spilled material.

## 7. HANDLING AND STORAGE

Good industrial practice in housekeeping and personal hygiene should be followed.

**Storage**

Compatible materials for storage: stainless steel, aluminium, fibreglass, plastic
Incompatible materials for storage: unlined mild steel, galvanised steel, see section 10.
Keep out of reach of children.
Keep away from food, drink and animal feed.
Keep only in the original container.
Shelf life currently under test.
Recommended maximum shelf life: 2 years.
Follow all local/regional/national/international regulations.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**Airborne exposure limits**

| Components | Exposure Guidelines |
|---|---|
| Isopropylamine salt of glyphosate | No specific occupational exposure limit has been established. |
| Other ingredients | No specific occupational exposure limit has been established. |

**Engineering controls**

No special requirement when used as recommended.

**Eye protection**

If there is significant potential for contact:
Wear chemical goggles.
Applicators and other handlers must wear eye protection.

**Skin protection**

If repeated or prolonged contact:
Wear chemical resistant gloves.

**Respiratory protection**

No special requirement when used as recommended.

When recommended, consult manufacturer of personal protective equipment for the appropriate type of equipment for a given application.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

These physical data are typical values based on material tested but may vary from sample to sample. Typical values should not be construed as a guaranteed analysis of any specific lot or as specifications for the product.

| | |
|---|---|
| Colour/colour range: | Amber - Brown |
| Form: | Liquid (viscous) |
| Odour: | Slight |
| Flash point: | None. |
| Specific gravity: | 1.199 |
| pH: | 4.8 |

## 10. STABILITY AND REACTIVITY

**Stability**
Stable under normal conditions of handling and storage.

**Hazardous decomposition**
Thermal decomposition: Hazardous products of combustion: see section 5.

**Materials to avoid/Reactivity**
Reacts with galvanised steel or unlined mild steel to produce hydrogen, a highly flammable gas that could explode.

## 11. TOXICOLOGICAL INFORMATION

This section is intended for use by toxicologists and other health professionals.

Data obtained on similar products and on components are summarized below.

**Acute oral toxicity**
**Rat, LD50**: > 5,000 mg/kg body weight
Practically non-toxic.
FIFRA category IV.

**Acute dermal toxicity**
**Rat, LD50**: > 5,000 mg/kg body weight
Practically non-toxic.
FIFRA category IV.

**Skin irritation**
**Rabbit, 6 animals, OECD 404 test**:
Days to heal: 10
Primary Irritation Index (PII): 1.7/8.0
Slight irritation.
FIFRA category IV.

**Eye irritation**
**Rabbit, 6 animals, OECD 405 test**:
Days to heal: 7
Moderate irritation.

FIFRA category III.

**Acute inhalation toxicity**

**Rat, LC50, 4 hours, aerosol**: > 2.01 mg/L
Practically non-toxic.
FIFRA category IV.

**Skin sensitization**

**Guinea pig, Buehler test**:
Positive incidence: 0 %
Negative.
No skin sensitization

**N-(phosphonomethyl)glycine; {glyphosate}**

**Mutagenicity**

**In vitro and in vivo mutagenicity test(s)**:
Not mutagenic.

**Repeated dose toxicity**

**Rabbit, dermal, 21 days**:
NOAEL toxicity: > 5,000 mg/kg body weight/day
Target organs/systems: none
Other effects: none

**Rat, oral, 3 months**:
NOAEL toxicity: > 20,000 mg/kg diet
Target organs/systems: none
Other effects: none

**Carcinogenicity**

**Mouse, oral, 24 months**:
NOEL tumour: > 30,000 mg/kg diet
NOAEL toxicity: ~ 5,000 mg/kg diet
Tumours: none
Target organs/systems: liver
Other effects: decrease of body weight gain, histopathologic effects

**Rat, oral, 24 months**:
NOEL tumour: > 20,000 mg/kg diet
NOAEL toxicity: ~ 8,000 mg/kg diet
Tumours: none
Target organs/systems: eyes
Other effects: decrease of body weight gain, histopathologic effects

**Toxicity to reproduction/fertility**

**Rat, oral, 3 generations**:
NOAEL toxicity: > 30 mg/kg body weight
NOAEL reproduction: > 30 mg/kg body weight
Target organs/systems in parents: none
Other effects in parents: none
Target organs/systems in pups: none
Other effects in pups: none

**Developmental toxicity/teratogenicity**

**Rat, oral, 6 - 19 days of gestation**:
NOAEL toxicity: 1,000 mg/kg body weight
NOAEL development: 1,000 mg/kg body weight
Other effects in mother animal: decrease of body weight gain, decrease of survival
Developmental effects: weight loss, post-implantation loss, delayed ossification
Effects on offspring only observed with maternal toxicity.

**Rabbit, oral, 6 - 27 days of gestation**:
NOAEL toxicity: 175 mg/kg body weight
NOAEL development: 175 mg/kg body weight
Target organs/systems in mother animal: none

Other effects in mother animal: decrease of survival
Developmental effects: none

## 12. ECOLOGICAL INFORMATION

This section is intended for use by ecotoxicologists and other environmental specialists.

Data obtained on similar products and on components are summarized below.

**Similar formulation**

**Aquatic toxicity, fish**
**Rainbow trout (Oncorhynchus mykiss):**
Acute toxicity, 96 hours, static, LC50: 5.4 mg/L
Moderately toxic.
**Bluegill sunfish (Lepomis macrochirus):**
Acute toxicity, 96 hours, static, LC50: 7.3 mg/L
Moderately toxic.
**Aquatic toxicity, invertebrates**
**Water flea (Daphnia magna):**
Acute toxicity, 48 hours, static, EC50: 11 mg/L
Slightly toxic.
**Avian toxicity**
**Mallard duck (Anas platyrhynchos):**
Dietary toxicity, 5 days, LC50: > 5,620 mg/kg diet
Practically non-toxic.
**Bobwhite quail (Colinus virginianus):**
Dietary toxicity, 5 days, LC50: > 5,620 mg/kg diet
Practically non-toxic.
**Arthropod toxicity**
**Honey bee (Apis mellifera):**
Oral/contact, 48 hours, LD50: > 100 µg/bee
Practically non-toxic.
**Soil organism toxicity, invertebrates**
**Earthworm (Eisenia foetida):**
Acute toxicity, 14 days, LC50: > 1,250 mg/kg soil
Practically non-toxic.

**Isopropylamine salt of glyphosate (62%)**

**Aquatic toxicity, algae/aquatic plants**
**Green algae (Scenedesmus subspicatus):**
Acute toxicity, 72 hours, static, EbC50 (biomass): 72.9 mg/L
Slightly toxic.

**N-(phosphonomethyl)glycine; {glyphosate}**

**Bioaccumulation**
**Bluegill sunfish (Lepomis macrochirus):**
Whole fish: BCF: < 1
No significant bioaccumulation is expected.
**Dissipation**
**Soil, field:**
Half life: 2 - 174 days
Koc: 884 - 60,000 L/kg
Adsorbs strongly to soil.

**Water, aerobic:**
Half life: < 7 days

## 13. DISPOSAL CONSIDERATIONS

**Product**
Recycle if appropriate facilities/equipment available.
Burn in special, controlled high temperature incinerator.
Keep out of drains, sewers, ditches and water ways.
Follow all local/regional/national/international regulations.

**Container**
See the individual container label for disposal information.
Triple or pressure rinse empty containers.
Pour rinse water into spray tank.
Store for collection by approved waste disposal service.
Recycle if appropriate facilities/equipment available.
Emptied containers retain vapour and product residue.
Observe all labelled safeguards until container is cleaned, reconditioned or destroyed.
Follow all local/regional/national/international regulations.

## 14. TRANSPORT INFORMATION

The data provided in this section is for information only. Please apply the appropriate regulations to properly classify your shipment for transportation.

Not hazardous under the applicable DOT, ICAO/IATA, IMO, TDG and Mexican regulations.

## 15. REGULATORY INFORMATION

**TSCA Inventory**
All components are on the US EPA's TSCA Inventory

**OSHA Hazardous Components**
Surfactant(s)

**SARA Title III Rules**
Section 311/312 Hazard Categories
Immediate
Section 302 Extremely Hazardous Substances
Not applicable.
Section 313 Toxic Chemical(s)
Not applicable.

**CERCLA Reportable quantity**
Not applicable.

## 16. OTHER INFORMATION

The information given here is not necessarily exhaustive but is representative of relevant, reliable data.
Follow all local/regional/national/international regulations.
Please consult supplier if further information is needed.
In this document the British spelling was applied.

Full denomination of most frequently used acronyms. BCF (Bioconcentration Factor), BOD (Biochemical Oxygen Demand), COD (Chemical Oxygen Demand), EC50 (50% effect concentration), ED50 (50% effect dose), I.M. (intramuscular), I.P. (intraperitoneal), I.V. (intravenous), Koc

(Soil adsorption coefficient), LC50 (50% lethality concentration), LD50 (50% lethality dose), LDLo (Lower limit of lethal dosage), LEL (Lower Explosion Limit), LOAEC (Lowest Observed Adverse Effect Concentration), LOAEL (Lowest Observed Adverse Effect Level), LOEC (Lowest Observed Effect Concentration), LOEL (Lowest Observed Effect Level), MEL (Maximum Exposure limit), MTD (Maximum Tolerated Dose), NOAEC (No Observed Adverse Effect Concentration), NOAEL (No Observed Adverse Effect Level), NOEC (No Observed Effect Concentration), NOEL (No Observed Effect Level), OEL (Occupational Exposure Limit), PEL (Permissible Exposure Limit), PII (Primary Irritation Index), Pow (Partition coefficient n-octanol/water), S.C. (subcutaneous), STEL (Short-Term Exposure Limit), TLV-C (Threshold Limit Value-Ceiling), TLV-TWA (Threshold Limit Value - Time Weighted Average), UEL (Upper Explosion Limit)

This Material Safety Data Sheet (MSDS) serves different purposes than and DOES NOT REPLACE OR MODIFY THE EPA-APPROVED PRODUCT LABELING (attached to and accompanying the product container). This MSDS provides important health, safety, and environmental information for employers, employees, emergency responders and others handling large quantities of the product in activities generally other than product use, while the labeling provides that information specifically for product use in the ordinary course. Use, storage and disposal of pesticide products are regulated by the EPA under the authority of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) through the product labeling, and all necessary and appropriate precautionary, use, storage, and disposal information is set forth on that labeling. It is a violation of federal law to use a pesticide product in any manner not prescribed on the EPA-approved label.

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